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Cost Control Procedures for the Small Manufacturer

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A comprehensive review is offered here of the problems relative to the installation, maintenance and application of cost control in a small plant. Procedure simplifications are discussed in addition to the use of alternate cost plans and methods of control. Particular emphasis is placed on the attitude of management.

SIMPLIFIED COST CONTROL procedures for the small manufacturer form a specialized study. The purpose of this paper is to discuss how to simplify conventional production-type cost control plans, with the point in mind of making them more economically justifiable for the small manufacturer's use. The scope of application of cost control procedures in the small manufacturing field is unlimited. Acceptance of cost control procedures by small plant management and small plant personnel, is a vital matter today, because the small manufacturer currently faces a period of more intensive competition, in which he will need all the management tools that he can command. The object of this paper is to shed light on the design of cost control procedures which may be successfully proposed to small plant management and be of economic use to this industrial group.

The Small Manufacturer and His Cost Control Situation

If a small plant is defined as one with less than 100 employees, then 90 per cent of all the manufacturing firms in this country may be classified in the small plant group, according to the U. S. Department of Commerce, Census of Manu-

facturers, 1947. Typical problems which most small manufacturers face as related to cost control are:

1. Our sales prices are not competitive. How should we set prices?
2. How can we determine anticipated profits on orders?
3. What would our costs be at various volume levels? What is our breakeven point?
4. What is our normal operating capacity? What is the normal overhead rate for each department or for the plant?
5. Will adding working capital to our present investment be justified?
6. What are rising labor and material costs doing to our cost picture and to our profits?
7. How can we make our employees more productive? Can we justify the purchase of new equipment? How much can we afford to put into methods improvement?
8. Specifically, what are our costs and which costs need to be reduced? If we knew certain costs and planned on them, how could we control these costs to earn anticipated profits? How can we control expenses?

What distinguishes small plants from large plants in their attempts to get answers to these typical problems? Larger plants can afford large staffs to maintain costly systems for cost control and the expense, when written off over higher quantity production, is less of a cost factor than in a small manufacturing plant. The attitude of the owner of a small plant is generally that cost control procedures are very desirable, providing they do not increase overhead and pay their way with realized savings. Over-expectation of early recovery of installation and operation expense through immediate savings discourages many installation attempts. Economic justification is rightly paramount in the mind of small plant management. However, cost control plans yield results not readily subject to dollar and cent evaluation at the beginning of the installation. It may be advisable for cost control to be installed to give only partial coverage at the outset, and this coverage should be on items or operations yielding clearest results.

Another deterrent to a successful installation of cost controls is absence of trained personnel to carry on the system. Management's mistake, in many cases, has been to expect the trained accounting personnel to take over cost control work on top of their present responsibilities. Under these circumstances, you will find the existing bookkeeping or accounting staff fighting against the installation of cost controls. Making sure that there is some employee properly trained and with adequate time to carry on the plan is of paramount importance.

The Whole Company Must Share in Installing the Cost Control Plan

Management must be convinced of the need of cost control plans and its complete backing must be gained before any cost control plan is initiated. Implied approval by management or a sympathetic attitude toward cost control is not enough. Small plant management is accustomed to working with informal cost

control methods, i.e., rules of thumb, which have been found to be of some value in the past, but these give limited knowledge of cost control procedures, particularly as to how to work to reduce loss and increase profit. Nor do these rules afford any appreciation of beneficial results to be looked for from operation of a cost control plan and they do not provide a basis for determining what it is worthwhile to pay for cost control information. These considerations serve to emphasize the importance of recognizing from the beginning that small plant management can stop an installation at will or can unintentionally build up hidden opposition to the operation of the plan. It is necessary to keep management personnel well-informed of the plan's progress, explaining carefully the purpose for each phase of the plan, as fully as management is able to absorb the information at the moment. It is well to be very cautious of an installation which proceeds without arousing management's questions and active participation for there is trouble ahead. The apparent calm is usually due to management complacency or unwillingness to reveal lack of knowledge, and results in the plan, once installed, being regarded as the accountant's. The plan is on trial at all times and results count. A sympathetic management watches systems installation costs far less than a critical one. The "breather," i.e., the time needed to complete the work, may come only from a sympathetic management.

Plant and office personnel will be affected by the operation of the cost control plan. The accountant needs help from these people, both in the installation and operation of the plan. Fully explain the purpose of the plan, how it will operate, how it will effect jobs, how individuals will benefit, and how they can help. This will avoid the possibility of misunderstanding developing ahead of the installation. Both plant management and plant personnel are people with specialized experience in the particular plant and are best able to put the plan to practical test. It is much better to discard the unworthy features of the plan ahead of or during the installation than to have trouble with these points later during the operation. It is important to concentrate at this stage on discussing the way in which cost control will help to keep the company healthy and consequently enable the employees to keep their jobs.

General Accounting Which Opens the Way for Cost Accounting

Whether a cost control plan is in operation or not, the small manufacturing company requires an accounting system which will give its management, at the minimum, quarterly financial statements. This account system should consist of an individually designed chart of accounts, general and subsidiary ledgers, and a conventional journal setup consisting of the check register, the cash re-

ceipts journal, the sales journal, the purchase journal, the petty cash book, and the general journal. Most managements would agree that quality accounting records are necessary to meet the needs of today's tax reports, labor reports, and financial reports. However, the quarrel of the usual small plant management is that bookkeeping costs too much.

To help keep bookkeeping cost down, to make bookkeeping time available for cost controls instead of historical recording, much can be done to simplify the bookkeeping system. Some of these steps toward simplification will be mentioned briefly:

1. Keep the accounts payable subsidiary records in file form rather than in a ledger form. Discard the purchase journal or voucher register by combining it with the check register. Distribute vendors' invoices or payroll charges to the proper account in the check register, when paid. Summarize accounts payable total monthly and prove to the vendors' statements in the file.
2. Journalize sales by monthly totals instead of individual invoices. Retain the accounts receivable control account. Retain the accounts receivable subsidiary only if there is value having a record of business done with customers in the past.
3. Save duplication by writing employee name once for each payroll. If paying by check either journalize just the net check register or enter the check number in the payroll book, with a control total in the check register. Both methods require supplementary month-end adjustments for withholdings.
4. Some small firms have substituted the check book stubs for the check register, using account code numbers for distributing the check payments, thereby saving double writing.
5. Some small firms have eliminated the general ledger, substituting work sheets and recap summaries in the journals of original entry.

Of primary importance, also, in the design of the general accounting system, looking toward cost control, is the chart of accounts. The chart of accounts of the typical small manufacturer is ordinarily designed primarily for income tax accounting and profit and loss determination. Most charts permit the proper segregation of asset and liability accounts but fall down badly on segregation of income and expense accounts. Little thought is given to proper accounts to eliminate lumping unlike expenses to facilitate determination of overhead rates, or to control accumulation of costs for cost system purposes. However, without proper expense account segregation, fixed and variable budgets would be impossible, except for budgeting total company expense.

Therefore, the chart of accounts should include the accounts required to control the cost plan—cost of sales, work-in-process inventory, finished goods inventory, variance accounts, and burden clearing accounts—and should separate the manufacturing expense group from the commercial expense group of expense accounts. It should also be set up to separate non-productive labor from productive labor and should permit the building up of a product cost estimate by following the chart structure. Such a typical chart of accounts has been included here as Exhibit 1.

CHART OF ACCOUNTS

ASSETS

1. **Current Assets:**

100 Petty Cash Funds	142 Raw Material C
102 Cash in Banks	143 Other Direct Materials
110 Accounts receivable -- Trade	144 Packing Materials
111 Accounts receivable -- Other	145 Work in Process
112 Notes receivable	146 Finished Goods
115 Provision for Bad Debts	147 Factory Supplies
122 Life Insurance Cash Surrender Value	148 Fuel
140 Raw Material A	149 Office Supplies and Postage
141 Raw Material B	

2. **Fixed Assets, Intangibles, Deferred Charges:**

200 Land	221 Reserve for Depreciation
210 Buildings	240 Office Furniture and Equipment
215 Reserve for Depreciation	241 Reserve for Depreciation
220 Machinery and Equipment	280 Interest Prepaid
221 Reserve for Depreciation	281 Taxes Prepaid
230 Autos and Trucks	286 Insurance Prepaid

LIABILITIES AND NET WORTH

3. **Current Liabilities**

300 Accounts Payable -- Trade	312 Commission Accrued
301 Accounts Payable -- Other	312 Employees' Vacations Accrued
302 Dividends Declared	313 Social Security Taxes Accrued
303 Social Security Taxes Withheld	314 State and Local Taxes Accrued
304 Federal Income Taxes Withheld	315 Provision for Income Taxes
306 Notes Payable - Banks	316 Interest Payable Accrued
308 Notes Payable - Other	317 Compensation Insurance Accrued
310 Salaries and Wages Accrued	

4. **Fixed Liabilities:**

400 Long-term Debt

5. **Capital Stock and Surplus:**

510 Capital Stock Preferred	513 Earned Surplus
511 Capital Stock Common	514 Profit and Loss
512 Capital Surplus	

INCOME AND EXPENSE

6. **Sales, Deductions:**

600 Sales	610 Returns and Allowances

7. **Cost of Sales:**

700 Manufacturing Cost of Sales	723 Labor Variances
710 Commercial Cost of Sales	724 Manufacturing Burden Variances
721 Material Quantity Variances	725 Commercial Burden Variances
722 Material Price Variances	

8. **Manufacturing Burden:**

800 Superintendent and Foremen	832 Indirect Materials
810 Departmental Indirect Labor	834 General Factory Supplies
811 Service Labor	840 Transportation Inward
820 Overtime and Shift Premiums	843 Research and Laboratory
821 Vacations and Allowances	844 Repairs and Maintenance Buildings
822 Correcting Defective Work	845 Repairs and Maintenance Machinery
823 Pensions and Pension Plans	848 General Factory Expense
824 Compensation Insurance and Accidents	890 Insurance
825 Group Insurance	892 Taxes
826 Social Security Taxes	894 Depreciation
830 Fuel Used	899 Burden Clearing Accounts
831 Power, Light and Water	

9. **Commercial Burden:**

900 Salesmen's Compensation	946 Company Auto Expense
904 Sales Traveling Expense	966 Postage
905 Sales Auto Expense	967 Telephone and Telegraph
911 Advertising	968 Subscriptions and Dues
918 Transportation Outward	969 Donations
919 Other Selling Expense	970 Bad Debts
960 Executive Salaries	973 Life-Insurance Premiums
961 Office Salaries	974 Social Security Taxes
962 Professional Services	978 Other Administrative Expense
963 Executive Traveling	979 Commissions to Agents or Jobbers
964 Office Supplies and Expense	999 Burden Clearing Accounts

10. **Other Income and Charges:**

1000 Cash Discounts Received	1010 Interest Paid
1001 Interest Received	1011 Cash Discounts Allowed
1005 Sundry Sales and Income	1012 Federal Taxes on Income

EXHIBIT 1

The accounting system should be kept on the accrual basis. Routine adjustments are required at the end of each period to reflect the true income and expense. Another critical point and one on which management has to make a major decision in advance of any cost control installation is that cost considerations, and not income tax considerations, will govern inventory values and the capitalization of fixed assets. Income tax considerations have often spoiled the best intentioned and the best designed cost control plans.

Production Records Required for Labor and Material

Production records are the frame-work for effective cost control. They are to the factory production system what the chart of accounts is to the accounting system. An intelligently designed and consistently used chart of accounts plus an early installation of the essential production records is a "must" for the subsequent proper operation of any cost control plan. Early installation of production records provides more time to train employees in their operation and to overcome the natural resistance to accounting for quantity throughout the factory. Cooperation of employees is best obtained by the gradual instilling of confidence in the sincerity of the purpose of a procedure or record and its benefit to them.

Fundamentally, the production records required would be the same for both actual and standard cost plans. These production records might be classified into two groups:

Group 1	Group 2
Sales orders	Production orders
Shipping authorizations	Material and supply requisitions
Day time-cards	Job time-cards
Purchase orders	Perpetual inventory control cards
Receiving authorizations	

Sales orders, purchase orders, day time-cards, and shipping and receiving authorizations are kept by the typical small manufacturing firm even in the absence of a formal cost control plan. The firm which has some form of production control would need production orders, requisitions, job time cards, and perpetual inventory records. Group 2 records will give production control and quantity-usage cost control, and permit the accumulation of actual hours and material quantity used for computing future estimates.

Cost control is then primarily concerned with Group 2, which provides continuous records of labor hours and quantities of material used on a given production order and permits the accurate charging of indirect or non-productive labor and supplies. Group 2 records may be kept continuously, with only partial

analysis of the significant production orders being made, or kept partially for selected groups of production orders. If practical, partial record-keeping and partial analysis can be one significant way to keep record-keeping expense to a minimum. If the same products are being made over a long period, production records may be kept on a sampling basis for short periods. Either of the above techniques saves record-keeping costs, but both sacrifice continuous, immediate knowledge of cost leaks.

Labor and Material Records

The day time-card and the job time-card are the labor records. Elapsed hours on the day time-card represent the total time worked, regardless of how this time was spent. The job time-card elapsed time, when totaled, should equal the elapsed hours for the day as shown on the day time-card. The main difficulties experienced with these reports are in getting employees to report quantities accurately, to report the correct order number, and to separate accurately non-productive and productive time. A time clerk could insure reasonable accuracy on these points but, since many small plants cannot afford time clerks in the plant, the foreman must supervise time reporting by his employees. Partial time-keeping on significant orders may help. It would simply mean that productive hours would be reported on the job time card for those orders only, along with keeping a day time card. Special steps would have to be taken to double-check the accuracy of partial recordings.

Material control is maintainable through the purchase order, receiving records and material and supply requisitions. All receipts are verified against purchase orders before posting to the perpetual inventory record. Withdrawals, evidenced by requisitions, are also recorded in the perpetual inventory. By periodic physical count of the materials on hand at a given date, a check with the perpetual inventory balance can be obtained. Reconciliations and adjustments can be made.

When purchase orders are received from customers, shipping authorizations can be used to control the finished goods movement and provide the basis for reducing the balances in the perpetual inventory record of the finished goods.

In this way material control records can be kept simple. Depending on the layout and the size of the particular plant, the system may be enlarged or contracted as required. In some circumstances, each department might have its own stock room with its own perpetual inventory control. Partial record-keeping of material quantities can be done in terms of significant materials or significant

orders. Perpetual inventory recording is time-consuming and is often advisably limited to a few costly items of material.

It does not make a great deal of difference, with respect to records of labor and material, whether actual or standard costs underlie the system, except possibly for inventories. Actual-cost control plans require the use of perpetual inventories for finished parts, finished sub-assemblies, and finished assemblies for dollar costing purposes. Standard control plans could carry raw material, work-in-process, and finished items at standard costs and, hence, would need the perpetual inventory only as a quantity record. The finished goods inventory and work-in-process could be combined. Standard-cost control plans require essentially the same labor and material quantity records as actual-cost control plans.

Of prime importance are two points in labor and material quantity control. First, the quantity control system, to the extent required, should be in complete operation prior to the installation of dollar control. Second, quantity reporting should be periodically audited in a manner similar to the auditing of dollar controls.

The "How" of Burden Rates

The normal expense rate at normal capacity is that dollar rate at which expense is absorbed from the incurred expense pool. Wherever possible, it is recommended that there should be only one normal factory expense rate and one commercial expense rate for the entire plant.

The primary object is to absorb the expenses as incurred and to apportion these expenses to production orders or to cost of sales during a given year. One definition of normal capacity is the level of utilization of physical plant required to meet average commercial demands over a period of time long enough to level out the peaks which come with seasonal and cyclical variations. Normal plant capacity may be expressed in labor hours, labor dollars, or machine hours. Where labor is the predominant prime cost element, labor dollars or labor hours would be used. Where labor usage is the minor factor and machine usage predominant, machine hours would be used as the basis. Normal commercial capacity is expressed in dollars of cost at normal sales volume levels.

To determine normal expense rates at normal capacity, the individual expense accounts in the factory expense group and in the commercial expense group must each be separated into its fixed and variable elements. A fixed expense is one which does not vary with a change in volume. A given expense may be partly fixed and partly variable. A wholly variable expense is one which varies directly with changes in volume. The simplest way to break down an expense

account into the fixed and variable elements is by plotting past yearly, monthly, or quarterly expense values on graph paper on the ordinate axis and the corresponding direct labor dollars or direct labor hours or machine hours for the same month or quarter on the abscissa. If the accounting records in the past were summarized quarterly, the expense values for a particular account can be plotted for quarterly periods. If the expense values were determined monthly, the plotting can be done for monthly periods. A straight line fitted to the points on the graph would intersect the ordinate at the fixed expense level. The slope of this straight line would give the variable expense rate.

Past performance is not necessarily a good basis for predicting future performance. There may be changes in production and sales conditions and, consequently, in factory and commercial expenses. The total expense for a given account at various volumes should be reconstructed, at least once a year, particularly if management wishes to use the fixed expense amounts and the variable rates for budgeting. Expense amounts will thus be kept more in line with actual production or commercial conditions. For economy purposes, it is always advisable to have the expense estimates kept on the tight, but attainable, side.

To get the total normal factory expense at normal capacity for the plant, the fixed expense amounts and the variable expense rates for the individual expense accounts within the factory group must be totaled. The total variable expense amount at normal capacity is computed by multiplying the total plant variable expense rate by the normal capacity. The total amount of normal variable expense plus the total fixed expense equals the total normal factory expense at normal capacity. By dividing the total normal expense by the normal capacity, the normal factory expense rate per capacity unit is determined. The normal commercial expense rate would be constructed similarly in terms of cost of sales in dollars.

The normal factory expense rate is used to absorb factory expense into production orders. This is accomplished by multiplying the rate by the capacity units on a particular production order. Commercial expense is absorbed into sales orders by multiplying the normal commercial expense rate by the cost of sales in dollars on the particular sales order.

Controlling Expenses with the Variable Budget

One of the easiest cost groups to put under cost control is the expense group, through the medium of the variable budget. This is so because a properly segregated chart of accounts, with the accounts periodically summarized, automatically provides the actual expense figures for comparisons with the budgeted expense figures.

The variable budget may be set up in chart form, showing the budgeted expense accounts for each expense account at varying volume levels. The selected range of volume variations might be, for example, between 70 per cent and 150 per cent of normal volume. From the graphs, the budgeted expense values at each volume level may be determined and posted to a variable budget table. Each month, the actual expense is determined and compared with the allowed expense as shown on the table. Both the actual expense and the allowed, or budgeted, are posted to a columnar work sheet for control through comparison. This work sheet should show both the expense totals for the month in question and the cumulative totals for the year to date.

Thus, the variable budget utilizes the principle of cost control through the media of first setting a standard expense, comparing the actual expense to the standard, determining the differences, and then taking the necessary action to keep the actual expense in line. The budget estimate, once established, is an important cost element, on the basis of which management plans for profit. Exceeding the budgeted or standard expense may mean the possibility of less profit for the company in that particular period.

It must be kept constantly in mind that the purpose of the budget estimate is to provide a control tool. Loose (high) budget figures do not control expenses. Neither do budget expense estimates arbitrarily arrived at or low to the point of impracticality. It should not be forgotten that responsibility of attaining or bettering the budget allowance is primarily in the hands of the supervisor of the activity being budgeted. Impractical budget allowances will stifle the supervisor's incentive to better the budget.

A variable budget for either factory or commercial expense, with its normal rates at normal capacity, makes possible separation of under or over applied expense into volume and efficiency causes. The difference due to volume is defined as the difference between the variable budget allowance for a given volume and the amount of expense which has been charged into production orders, using the normal expense rate. This simply means comparing the total expense which would be allowed for the production of a given volume of work with the total absorbed expense as shown in the factory burden clearance account. The difference between the expense incurred and the amount of expense allowed by the budget to produce a given production volume, is called the efficiency variance. Factory supervision may be held accountable for the efficiency variance, but the volume variance is top management's responsibility. Through the use of the efficiency variance and the individual account comparison between the expense incurred and the expense allowed, management of the small plant is in the position to detect expenses which are getting out of line. Both unfavorable volume

variance and unfavorable efficiency variance show up potential sources of losses, due to departures from conditions upon which budgeted profit was based.

Simplified Actual Costing

Actual cost plans have been used in industry for many years. Much has been written on the subject and it is not the intent of this paper to cover the operation of such plans in detail. Rather, the objective is to point out how actual cost control plans may be simplified in design and operation. These plans are employed to determine the cost of the product both to make and to sell. Cost to make and sell is the total of the direct material cost plus the direct labor cost plus the normal factory expense plus the normal commercial expense.

Computation of the normal expense rates has been previously discussed, along with the manner in which the normal rates are used to apply actual expense whether to production orders or to sales orders. Direct material costs are transferred from the perpetual raw material inventory to the production order. A perpetual inventory record permits the charge out of raw material requisitions at whatever valuation method is in use: average costs, first-in first-out costs, or last-in first-out costs. Direct labor hours are charged to a given production order and extended by the hourly rate to arrive at the direct labor cost.

Upon closing a production order for the manufacture of a piece-part, the total cost of material, labor and factory overhead is divided by the quantity completed to determine the unit cost of the piece part. An adjustment is then made to transfer the cost of completed piece parts from work-in-process to finished goods inventory. Piece parts are charged out as requisitioned into sub-assembly work in process or finished assembly work in process. Factory overhead is applied to assembly labor and the cost of the assembly order is determined in terms of finished parts plus assembly material plus assembly labor plus assembly overhead. The unit finished assembly cost is determined by dividing the total cost of the completed assembly order by the number of assemblies completed. The assembly cost is then transferred from assembly work-in-process to the finished goods inventory. As the product is sold, the cost to make the finished assemblies is transferred from the finished goods inventories to cost of sales. At this point, commercial overhead is applied to the factory cost to give the total cost of sales.

The foregoing describes rather simply how the cost to make and sell a product is determined. A knowledge of actual costs permits the checking of original estimates. By proper analysis of the comparison of actual cost to estimated cost, the estimators may use new data as it is developed, for future estimates. However, the usual application of actual costing requires that production be fol-

lowed by production orders through the stages of processing, into successive inventories, and into cost of sales. The required summaries, transfer entries, and inventory bookkeeping requires considerable time. The attendant expense makes the actual costing plan almost prohibitive for the small manufacturer.

If this is so, under what circumstances should an actual cost plan be used in a small manufacturing plant? Generally, actual-cost control plans should be used only in job shops which have non-repetitive orders and are characterized by short runs. The existence of short runs makes it improbable that an investment in standard costs would be recovered. Small plant management objects to most bookkeeping costs, particularly the routine bookkeeping required in a conventional actual cost plan. It would seem that, unless an actual cost plan can be simplified, the systems costs involved in it would be acceptable only to the larger custom order plants which could afford them.

It is not particularly easy to simplify an actual cost plan using perpetual or physical inventories, piece part and sub assembly work-in-process inventories, and finished goods inventories Actual costing may be partially simplified by costing only significant cost components on production orders or by recording costs for certain time periods only to provide a periodic check. The expense of maintaining a perpetual inventory can be reduced by the use of combination quantity and price cards instead of separate cards. The use of the detailed estimate to control actual costs as incurred, can eliminate much of the bookkeeping required to summarize and close orders by substituting the estimate for actual unit costs.

A substitute for actual costing is to use a cost reconstruction process. If quantity production records are maintained, it is possible to apply the current prices to an average amount of raw material and labor to obtain direct cost of a product. This approach would eliminate much of the routine bookkeeping required by the conventional system and would reconstruct the cost of significant products. This method is used on an informal basis by a number of managements of small plants to analyze the detailed reasons for profit or loss on products.

To make sure of the accuracy of individual production order costs, these costs should be periodically checked against control accounts in the general ledger. By a particular application of general ledger controls, many of the period-end adjustments for cost accounting purposes may be eliminated. Typical of such controls is that total credits in the raw material inventory control account should equal the sum of the individual production order debits to raw material for a given period. Direct labor and burden are similarly verifiable. Through use of such general ledger controls, the balances of which would increase through the period, the total of charges or credits in the production orders

open or closed, at the end of any given period, may be obtained and checked to the ledger account balances. As production orders are closed, they may be transferred to the closed order section to equal the ledger account totals. The actual cost plan purpose is thereby achieved, namely, to break down total factory costs by production orders and to break down commercial expenses by sales orders.

Simplified Standard Costing

The standard cost plan is, in itself, a further simplification of the actual cost plan, requiring the same quantity records, the same perpetual raw material inventory, and generally the same procedures up to the point of the incurrence of the cost, as the actual cost plan. Standard costing simplifies actual costing by eliminating the clerical effort of summarizing and closing orders and determining unit costs. The standard cost plan values raw material, work-in-process, and finished goods at standard costs and makes one cost pool out of work-in-process. The extent of this simplification is easily realized when one considers the numbers of piece parts, sub-assemblies, and assemblies in a typical manufactured product. The saving in bookkeeping effort is not all clear savings but must be balanced against the cost of determining labor and material standards. Not only must these standards be originally determined, but they must also be periodically reviewed and recalculated to keep them up to date.

A cost plan should be expected to show the calculated or anticipated costs of all products, by cost elements, to provide comparison of the anticipated cost with actual results and the reasons for any difference. This is to reflect the effectiveness of the utilization of labor, material, expense, and plant capacity, and to provide a measurement of performances against accepted standards. A standard cost plan will usually be found to best meet these essential costing requirements of the small manufacturer. Nevertheless, investment in cost standards determination is warranted only where order quantity or repetition justifies it.

The fundamental principle of standard costing is to calculate an anticipated standard quantity or cost, use this standard in product estimates, check profit margins, and, if profit is satisfactory, control the actual cost to the standard to realize anticipated profits. This is also a fundamental principal of good organization, which is to set a goal for a given activity and to control to that goal. It is of infinite value to management to be able to compare actual cost against cost standards at the point and time of incurrence of the cost. Something can be done to reduce actual costs to standard when compared in this manner. If the actual costs are allowed to become history, very little can be done to control the cost incurred.

In its simplest terms, a standard cost plan for a small manufacturer would operate as follows. A production order would be issued to make a specified quantity of a part. Direct materials are bought in quantities sufficient for more than one production order. Material price standards have been determined. These materials will be charged to raw material inventories at actual quantity and standard price and issued from raw material inventory on the same basis. Standard quantities and standard costs have previously been computed for this part. Actual material quantities used by the particular production order are posted to a comparison sheet, along with standard quantities, and action is recommended to management so that excess may be eliminated. Similarly, direct labor hours consumed on a given factory order are compared against standard hours and the excess of actual hours over standard is reported to management for action. Summaries of raw material price and quantity variances and direct labor rate and hourly variances can be drawn up from the basic data just given. Expenses would be controlled, using the variable budget.

If simplification is considered desirable by the small manufacturer, the following modifications to the complete standard cost plan may be made:

1. Calculate quantity standards for significant products or processes only. Use for continuous or periodic check to actual cost as incurred.
2. Calculate quantity standards only, for all products. Use for continuous check or periodic check against actual quantity as consumed.
3. Use standards to spot check costs at any point in the process.
4. Calculate dollar standards for significant products or for all products, and use to check profit margins. Eliminate continuous runs.

Justification for Cost Control Procedure — Actual or Standard

To justify the use of cost control procedures in the economic sense implies proving that the value received is in excess of value given. In small plants this means sufficient savings must be realized through the use of the plan to offset the plan's expense. A properly installed and operated cost control procedure functions to permit management planning for profit, to help management in the achievement of the planned profit, and to point up the need for cost reduction in specific areas and on specific products. A cost plan will do little directly to secure savings in materials, labor, or expense. Cost savings result not from the routine operation of a cost plan, but from the way in which the cost information is applied by management. To the extent that the cost procedure focuses management's attention on areas of high cost, it is but helping management direct its efforts toward cost reduction.

Possibilities for cost reduction may be indicated by either an actual or a standard cost system. Standard cost systems facilitate cost reduction through

utilization of the records supporting the standard cost computation for detailed analysis. By the use of the actual cost estimate in the same way as a standard cost, actual cost plans can be adapted to accomplish somewhat the same function of cost control.

An actual cost plan operates to check the planning accuracy of engineering design, production planning, tool design, etc. Without the comparison of actual product cost to estimated cost and to the sales prices, there would be no economic pressure on engineering and production groups to insure proper performance. Ordinarily, actual cost becomes history upon incurrence and of little use to management, unless lessons are learned which may benefit the future estimating. Much can be learned from past performance to guide future estimating, future product design, and process planning.

Most managements realize that an actual cost plan can function to point up the need for cost reduction. If products are made repetitively or if typical processes are used on more than one product, action can be taken to try to bring costs more in line with estimates. Unless the company has employees able to effect savings through cost reductions by using information gathered from the actual cost plan's operation, the cost plan cannot be justified by cost reduction alone. The actual cost plan, like the standard cost plan, must be recognized as being a very worthwhile source of factual information, without which management could not properly operate a manufacturing plant and retain its profit margins. Simplified cost control plans may mean the difference between staying in business and failure.

The standard cost plan provides excellent cost control tools which, like all tools, are of little value if improperly used. Standard cost plans, in general, cost less to operate than actual cost plans, provide control tools to keep actual costs in line, serve to point up areas in which costs need to be reduced, and so can be economically justified more easily than the actual cost plan. If cost plans are simplified to the extent permitted by the circumstances and if cost control is stressed from the beginning, with cost reduction made by a very pointed objective, cost plans will have little difficulty in being justified in the eyes of small plant management.

Cost Control Procedures and the Pricing Problem

One of the most pressing needs of small manufacturing plants today is for a pricing formula which is fair both to the consumer and to the producer. Many a firm is constantly realizing less than normal profits because its competition does not know true cost. It is not at all unusual to find that the estimating pro-

cedure used by management is not related to the costing plan in use within the plant. For example, in one small plant, it was found that estimates were based on the expense rate per machine hour, including the employee operator, whereas the expense rate used in the cost (actual) system was based upon expenses excluding operator. It is of utmost importance that the pricing formula used result in a total estimated cost to make, determined on the same basis of cost accumulation as is reflected either in an informal manner on the profit and loss statement or in detail in connection with the existing cost control procedure.

Estimating with actual costs usually comprises adding to the direct cost of labor and material, the normal expenses and normal profit, to arrive at a sale price. Or, if the sale price is set by competition, the cost determined by the method just mentioned is checked against the sale price to determine whether a normal profit margin will be obtained. Estimating with standard costs, once the standard costs have ben determined, is a much more accurate procedure. Inasmuch as standard costs are more accurately determined than estimates, and are systematically and periodically revised, an estimate based on standard costs more truly reflects the accurate cost to make.

Management can continue to blindly estimate costs to make and sell but, unless there is available some method of double-checking the accuracy of estimates, the estimating procedure and values may be worthless. This is the condition found in many small manufacturing plants. However, the use of cost control procedures permits management to make a definite attempt to realize planned profits.

Summary of Points Made

Selection of a cost control procedure may be made by management of the small plant or its chief accountant or by an outside accounting advisor. Regardless of who is to make the final selection, the primary point to observe religiously is that the specific need is spelled out by management, which is to pay the bill. Before proceeding with the installation, management must be made to realize fully what is involved. Initial misunderstanding has often resulted in scuttling of a well-intentioned plan. In achieving understanding with management, the chief accountant or the otuside accounting advisor should guard against trying to substitute his own point of view. The need for the plan, management's backing, the extent to which management will use the cost information, the availability of trained personnel, the natural organization problems which the plan will face, all dictate the selection of the cost control procedure, and all should be considered.

It has been pointed out that cost control requires certain basic records and operating routine. Management has to be "sold" on expense involved. Beyond this point, the cost of operating the plan will be determined by the procedure selected and the extent to which it is simplified. As already suggested, that area of application should be selected initially which will gain immediate beneficial results, will tend to satisfy management's concept of the need, and which will be economically justified in management's eyes. As management grows in its appreciation of the intangible values of cost control and uses cost information to a greater extent, more complete cost control may be installed gradually.

Actual cost plans are best adapted to low quantity, non-repetitive manufacturing plants, which are sometimes called special order or job shop. Actual costs provide the basis for estimating future costs and the determination of profit or loss after the costs have been incurred. Detailed actual cost estimates may be used to control costs in a manner similar to standard cost control methods. There is a great need to simplify actual cost control plans and, hence, keep the expense of operating them to a minimum. An all-out attempt should be made to eliminate routine bookkeeping wherever possible.

Standard costs may be used wherever quantity or repetition of cost incurrence justifies the expense of computing standards. Standard cost plans generally are less expensive to operate than actual cost plans, past the point of the basic record expense. The general guide in the selection of cost control procedures is to use standard cost plans wherever possible, primarily because this type of plan may be used to control costs at the point of incurrence and may be made self-enforcible through the use of incentives.

Variable budget expense control can be readily adopted as an expense control procedure separate from actual or standard labor and material cost plans or in conjunction with either type. It is inexpensive to operate and yields good control. For this reason, it is to be recommended for almost all small manufacturing plants doing a volume upward of $75,000 yearly sales. The variable budget procedure provides the normal expense rate so vital in estimating costs.

Cost reduction through cost control plans should be the objective of the accountant at all times. He should constantly try to disclose tangible savings to justify the expense of the plan. If constant attempt is made to secure appreciation of the intangible values of cost control, management may be brought around gradually to consider cost control plans an indispensable management tool, as indeed they are.

A Case History in Development of Cost Control

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A review of step-by-step establishment of effective cost control procedures, the accompanying presentation harks back to World War II and the years following, in which there was a new awakening to cost control in American industry. The establishment of labor and material standards, stores control, and management reporting are covered in a manner which may provide comparison or contrast with the development of like aids to control in other companies.

THIS ARTICLE PRESENTS an experience which discloses how the cost accounting structure developed in a manufacturing organization was responsible for the direct saving of several hundred thousand dollars annually by the use of financial and operating reports which focused the attention of management and supervision on excess costs.

The starting point lies more than a decade ago. The impetus was given when early in the war, a young engineer working with Minneapolis-Honeywell applied the electronic principle to an aeronautical gyroscope and stabilizing system, which was destined to become one of the finest navigation instruments for the control of directional bombing from our large B-29 planes. However, the C-1 automatic pilot was a very complex instrument, requiring about 429 parts and 3,800 operations from the machining of bar stock to the final assembly of the hundreds of electrical components and requiring also somewhere from 2,400 to 3,800 employees to handle the job.

It was necessary to plan for the layout and installation in logical sequence of about 700 machine units valued at $4,000,000, and to prepare working blueprints, bills of material, process and methods sheets to show each operation, design special tooling, hire supervisory personnel and train several thousand persons to operate machining equipment. Management was particularly concerned with the lack of skilled manpower and an acute shortage of material.

The Cost Department Shoulders Its Responsibilities

The cost accounting division played a very important part in the organization as it existed, it being their responsibility to develop the procedures for cost control so that variations of costs incurred by the manufacturing division could be reported to management. The entire accounting system and procedures as related to the new product were designed and developed from scratch with the

requirement that we must be ready to operate within three months' time. The groundwork was laid by the introduction of carefully developed standard procedures which were issued to all top management and supervisors.

In the construction of the chart of accounts which was to be used in this manufacturing division, it was necessary to consider what structure would best provide the essential figures for control. Variance accounts were established to yield key figures with respect to material, labor and burden, to be used by management and supervisors to determine the increase or decrease in performance and operating expenses. In the development of the cost accounting structure, the departmentalization of the manufacturing division was of prime importance. The determination of direct and indirect manufacturing departments for costing purposes was made carefully after a detailed study of the plant layout and of the logical flow of manufacturing operations shown in the process sheets. The prefix number of each account was set up to identify the department, with the account number proper defining the type of expense, so that all requisitions and expenditures could be conveniently classified and distributed to the proper departments and accounts.

In order to have a sound base for the development of variances in costs of direct labor and manufacturing burden in a standard cost accounting system, it is essential to have time-study standards or standard data for all labor operations. These time standards were determined for the operation in question by the industrial engineering department, which was responsible for the development of methods, work simplification and time study of 3,800 major labor operations. Standard hours and standard dollars, became our common denominator for the control of direct labor and manufacturing expenses in all departments.

Material Control Is Established

Stores control is essential to discover whether variances in material cost are the result of faulty workmanship, defective materials or are simply the dollar cost of improper control. It was made a hard-and-fast rule that all materials should be checked into stores by means of validated move tickets. Materials were removed from stores only upon a requisition which originated in the production control department. In this way, the storekeeper was prohibited from issuing any productive materials unless authorized for issue. As standard costs extended to stores, any nonstandard price paid (resulting in price variances) was known at the time materials were purchased.

Moreover, all raw materials were requisitioned on the basis of a pre-determined standard number of feet or pounds per piece part, so that the number of

pieces called for on the order automatically provided identical information for the production control, raw stores, and cost accounting departments. Issues over standard requirements were required to be separately authorized on an excess stores requisition before withdrawals could be made. The cost accounting department recorded the dollar cost of excess raw materials used in quantity variance accounts showing faulty materials recharged to vendors, defective part runs on the first operation, low stock yields, or costs arising from the substitution of materials. The excess costs were then charged to the department or vendor responsible so that corrective action could be taken by supervisors.

The control of materials in process in the shop was another matter. To identify each job and to provide the operator with adequate instructions for his work, a process sheet (sometimes called route sheet) was issued when the job was scheduled for production. The process sheet was used to identify the part number and the operation to be performed and to show the operator the required number of pieces per hour which were to be produced, as well as inspection standards and tolerances. Move tickets were written up by the production control department based on the information shown on the process sheet and quantities inserted from physical counts taken on all parts produced. These counts, which were then inserted on the operator's job ticket, served as the basis for measuring the work performed by each operator.

Short counts and spoilage by the operator were written up on scrap tickets by the inspection department and the process inventories were currently adjusted for defective work by costing the scrap to the stage of operations completed. Completed parts were removed from the work in process accounts by inspection tickets, cross referenced to the production release. Inspection counts taken from the move tickets were then used by the cost accounting department to extend the quantity delivered to finished parts stores and the dollar value was charged to inventory at standard cost.

Finished parts stores were also controlled on a standard cost basis, detailed as to standard materials and component assembly costs. Completed automatic pilots, gyro-stabilizers, pilot control boxes, electrical assemblies, etc., were handled similarly. From a final inspection report furnished by the inspection department, serial numbers of all completed pilots were registered and used as a basis for transferring the standard cost of the completed units from work-in-process and finished parts stores to finished goods stores. In addition, material stores controls were also established for the receipt and issuance of all perishable tools and factory supplies. When these items were needed in the manufacturing process, the supervisor using the tools and supplies authorized the withdrawals from the stores department and was held responsible for excess cost for manu-

facturing supplies and tools incurred by the operators working under his supervision. To these controls relying on standard costs, something by way of audit was added. Rotating inventory counts were made of piece parts in the stores department and on the manufacturing floor. These current checks prevented the accumulation of obsolete materials and provided for charging such obsolescence to operations. A complete physical inventory was taken annually of all stores departments to determine the accuracy of inventory records.

Hourly Labor Records Initiated

Because of the vital importance of direct labor in the successful operation of a manufacturing plant, close attention and control was given to this element of cost. Not only is direct labor a part of cost but, when controlled through the use of time-studied standard labor hours, it becomes the basis for the determination of manpower requirements for measuring the output of the operator, for the equitable application of manufacturing expense to product, and for extending the variable burden rate to provide an expense allowance for the operation of the budget.

Daily labor distribution was recorded on key-sort time cards, one card being used for each direct labor operation and for each overhead expense account charged. Before the cards were processed, total hours shown on the daily distribution time tickets were balanced daily for the elapsed hours recorded on the weekly clock cards, which were used to compute the weekly earnings of the employees. As each job was run, a daily distribution time ticket was completed to show the department in which the work was performed, the operator's clock number and name, the labor hours worked, and the part and operation number of the product worked on. Production counts and the unit standard hours on the process sheet were also entered on the daily time ticket for the purpose of computing the standard time allowed for the job. Timekeepers then punched out the various codes located along the border of the cards so that, upon delivery to the cost accounting department, they were ready for sorting and tabulation. Indirect labor was charged from the daily time tickets to the department incurring the expense, and by expense account number.

Dynamic Departmental Budgets Lead the Way

To provide management and supervisors with a basis for control of manufacturing expenses such as indirect labor, materials and supplies, maintenance, etc., it was recognized as essential to develop a dynamic budget which could be adjusted for changes in production volume. In setting up the budget, the

DAILY DEPARTMENTAL LABOR REPORT

☒ Hours ☐ Dollars

Foreman - Ceglarek-Mypa Dept. 31

Date Today	Acct.	Description of Labor Accounts Charged	Work Days to Date
	A	93% OPERATING EFFICIENCY (144S ÷ B) 91%	10
	562-3	Efficiency Variation ((AH - SH)SR)	
	562-2	Price Variation (AH(AR - SR))	
23	144-V	Loss on Standard Direct Labor (B - 144-S)	306
299	144-S	Direct Labor At Standard	3,094
322	B	Actual Direct Labor on Standards	3,400
	144-D	Direct Labor Not On Standards	
	C	Labor To Be Recharged Vendors	
	D	Labor To Be Capitalized	
	E	Labor--Tools, Etc.	
322	F	Sub-Total (B ↑ 144-D ↑ C ↑ D ↑ E)	3,400
2	G	Service Labor Recharged Other Depts.	12
324	H	TOTAL DIRECT LABOR (F ↑ G)	3,412
	02	Clerical	
	03	Trucking and Stock Handling	
	07	Group Leaders	
72	09	Resetting	695
6	10	Set-Up	50
	13	Methods	
	23	Salvage	
	24	Building Maintenance and Repair	
2	26	Teaching and Learning	23
	27	Tool and Die Rebuilding--Vendor's Fault	
35	28	Supervision	312
68	29	Inspection	710
8	35	Vacation Allowance	90
	38	Guard and Watch Service	
191	I	TOTAL INDIRECT--ACTUAL	1,880
6	J	Excess Cost--Over Budget	18
(66%)	K	% To Standard Direct Labor (I ÷ (H - 144-V))	(61%)
3	14-	Lost Time - (Explain)	120
-		Employee Grievance Conferences	2
4	19	Rework	11
	36	Overtime Premium	-
	37	Night Labor Premium	-
7	L	TOTAL PENALTY EXPENSE	133
4	M	Excess Cost--Over Budget	125
2%	N	% Standard Direct Labor (L ÷ (H - 144-V))	4%
198	O	TOTAL INDIRECT LABOR (I ↑ L)	2,013
520	P	Total Hourly Payroll (F ↑ O)	5,413
20	Q	Est. Indirect Labor - Monthly F/R	210
218	R	Total Indirect Labor (O ↑ Q)	2,223
10	S	Budget Variation (J ↑ M)	143
33	T	Budget Variation - Efficiency Var. (144-V ↑ S)	449
11%	U	% To Standard Direct Labor (T ÷ (H - 144-V))	15%

Dept. No. | Date Issue | Time Issued | Comp. Check | Dept. No.

EXHIBIT 1

history of the expenses of each department was carefully examined to eliminate abnormal and nonrecurring charges. Operating expenses were then reviewed with the supervisors to determine expenses which changed when production volume increased or decreased. These expenses were classified as variable and allowance rates were based on standard direct labor dollars which were used as a measure of production output. Budget allowances were then established by multiplying the standard direct labor dollars by the variable rate for each type of expense.

The fixed burden costs, such as supervisors' salaries within a range, depreciation, rent, etc., were shown as fixed costs because they were not influenced by

changes in production volume. The fixed dollar cost and the variable dollar cost were then added to determine the budget allowance for each type of expense. This was used as a basis for comparison with the actual expenses.

Daily Labor Report

A labor-control report (Exhibit 1) made it possible for the supervisor to see daily the production performance of the employees in his department and to control the effective performance of his manpower. It was really gratifying to see the progress that was made in the reduction of costs during a time when production at any cost was the universal theme of the day. The significant control figures in the departmental labor report as they appear on Exhibit 1, are:

Account No.		Hours
144-V	Loss on standard direct labor (B-144-S) represents the excess hours taken over the standard time allowed to perform direct-labor operations	23
144-S	Direct labor at standard is the standard time allowed for operations performed by employees on direct labor classifications	299
B	Actual direct labor on standard represents the actual time worked by employees on direct labor operations and recorded on keysort job cards	322
H	Total direct labor hours (F + G) represents all direct labor hours, including those not on standard	324
I	Total indirect labor hours represents the distribution of indirect hours by the detailed account classification for each department	191
J	Excess cost over budget [I ÷ (H − 144 − V] is an important control figure which should be carefully watched by the supervisor each day to determine the trend of indirect labor costs. The figure of 66 per cent can be compared with the budget percentage of 60 per cent and converted to excess indirect hours over budget	6
L	Total penalty expense is used to show excess hours of rework and lost time. At the end of the month, when the hourly cost is converted to dollar cost, night premium and overtime premium are also shown, to complete the total penalty expense	7
M	Excess cost over budget represents the total excess hourly cost of penalty expense. No budget allowance is given for lost time	7
S	Budget variation (J + M)	10
T	Efficiency and budget variation	33

Although the process sheets showing the labor operations to be performed also showed the standard time allowed and the number of pieces required per hour, it became evident that it was exceedingly difficult for the supervisor to

measure the operator's daily performance without further aid. A report was developed and furnished to all supervisors each day covering employee production against standards. As it would have taken a great deal of time to individually tabulate the production of all employees in the manufacturing division each day, the exception principle was applied and the report restricted to operators whose efficiency was less than 75 per cent.

The Monthly Expense Report; Report Design

The monthly statement of expense and budget (Exhibit 2) is a copy of the type of operating report developed for our departmental supervisors, plant manager and vice-president in charge of manufacturing. There are several very interesting figures in it which are significant to the supervisor and to management, which can be used as a basis for an improvement in operating conditions. In Department 31, Turret Lathes, the operating efficiency for the month on actual direct labor was 92.30 per cent, so that the loss was $706. This operating percentage was computed by dividing the standard direct labor dollars ($8,459) by the actual direct labor dollars (actual hours at standard hourly rate) of $9,164. The result appears as 92.30 per cent. This could be presented to the supervisor on the basis that these employees were being paid $9,164 but that the company received only $8,459 production value. The burden loss of $901 for the month represented manufacturing burden applicable to the excess direct labor of $705. The total excess cost of inefficiency for direct labor and burden during the month was $1,606.

It will also be noticed that for the month the scrap cost exceeded the budget by $1,326. Ordinarily, scrap cost may be a minor cost in production. However, due to scarcity of materials and lack of skilled manpower, it was important to develop procedures and reports for the control of scrap cost. This also gave us a basis to prevent inventory shortages of raw materials, piece parts and electronic sub-assemblies and to relieve inventory each month of the dollar cost of scrap.

The total variance, as shown on Exhibit 2, was $2,604 for the month in a department in which the supervisor was responsible for $26,802. For the year to date, covering five months, the operating efficiency was 88.65 per cent on direct labor costs of $44, 177. The loss on direct labor was $5,012. Burden on excess labor was $6,404. Total loss was $11,416. The total variance exceeded the budget for this five-month period by $17,873, covering total costs of $120,557. The figures would be more revealing if they could be shown beside figures representing the period when we first started these operations. The direct labor performance was between 40 and 50 per cent, and the supervisor

MONTHLY STATEMENT OF EXPENSE AND BUDGET
(Costs Omitted)

_____, 19__ Supervisor Coglarek-Hype Dept: TURRET LATHES No. 31 Schedule 40

ACCT. NO.	NAME OF ACCOUNT	CURRENT MONTH ACTUAL $	CURRENT MONTH (OVER) UNDER BUDGET $	YEAR TO DATE ACTUAL $	YEAR TO DATE (OVER) UNDER BUDGET $
%	Direct Labor Operating Efficiency		92.30%		88.65%
569-3	Less On Excess Direct Labor	706	(706)	5,012	(5,012)
572-4	Burden Loss on Excess Labor		(901)		(6,404)
144	Direct Labor At Standard	8,459		39,165	
144D	Direct Labor Not On Standards				
	Service Labor	44		52	
T	TOTAL DIRECT LABOR	9,209	(1,607)	44,230	(11,416)
54	Manufacturing--TOTAL SCRAP	2,848	(1,326)	7,926	(870)
01	Indirect Labor				
02	Clerical				
07	Group Leaders				
09	Resetting--Checking--Correcting	1,730	(120)	8,672	328
10	Set-Up	147	38	549	105
13	Methods			3	-
14	Lost Time	243	(243)	2,359	(2,359)
15	Employees Grievance Conferences	11	(4)	75	5
19	Rework Operations	164	20	449	(64)
26	Teaching & Learning	79	(12)	461	93
28	Supervision	928	22	5,101	1,021
29	Inspection	1,708	116	7,956	199
35	Vacation Allowance	769	19	1,802	14
36	Overtime Premium	1,353	63	7,356	320
37	Night Premium	626	13	2,436	(92)
89	Payroll Taxes--Federal and State	593	(62)	2,808	51
ST	TOTAL INDIRECT LABOR	8,357	(150)	40,052	(379)
52	Perishable Tools	509	68	2,880	(328)
53	Production Mt'ls--Not On Stds.				
54	Material and Supplies	107	(8)	435	23
66	Lubricants and Cutting Compounds	157	(6)	1,109	(140)
69	Rework Parts				
ST	TOTAL SUPPLIES	774	54	4,426	(445)
61	Mach. & Equip.--Repair & Maint.	2,079	(450)	8,525	(593)
63	Tool & Die Maintenance	737	(82)	3,054	96
64	Plant Rearrangment				
68	E.P.C. Tool Replacement				
ST	TOTAL MAINTENANCE	2,816	(532)	11,580	(497)
78	Rental--Machinery & Equipment	1,352	619	8,410	2,248
81	Building Service	671	(7)	3,695	123
98	Depreciation--Mach. & Equip.				
ST	TOTAL FIXED CHARGES	2,024	613	12,105	2,371
90	General				
94	Compensation Insurance	51	21	243	109
ST	TOTAL GENERAL	51	21	243	109
T	TOTAL INDIRECT EXPENSE	14,025	5	68,407	1,158
F	EXCESS FIXED COST		324		(6,744)
TV	TOTAL VARIATION COST		(2,604)		(17,873)
	Red figures in parentheses.				

EXHIBIT 2

claimed they were doing everything possible to improve production performance. Gradually, each month, there were improvements in production and the better understanding of how these production costs and operating expenses could be controlled. This was the typical progress which was made by the entire manufacturing division. The supervisors felt a real responsibility.

Tremendous progress has been made in the construction of management reports during the past ten years, which has helped considerably to overcome the usual reaction of the executives who have long complained of being buried under a mass of figures. Newer concepts of accounting, based on the principle of exception, are now being used to focus the attention of management quickly

on the unusual operating condition in all departments of an organization. Financial and operating reports show the causes, reasons and responsibility for decreases in profits due to excessive material usage, increase in labor costs because of inefficient production performance (decreased operator output per manhour), ineffective application of indirect labor, and excessive spending for materials, maintenance and supplies.

Through providing management with reports of this kind, it is possible—and has so proved in our case—to control expenses on a daily or weekly basis, so that immediate action can be taken instead of "locking the barn door after the horse has been stolen." Essentially, the top management reports are summaries of departmental statements given to the supervisor. These reports were designed to show excess costs of operations by lines of responsibility. It is, therefore, possible for the vice-president in charge of production to review the top management reports for each department, to determine whether or not the variances in departmental costs are of such importance as to require executive action and a discussion with the supervisor.

Variations in Burden Absorption Analyzed for Management

I wonder if, in a true cost-accounting sense, there should be unabsorbed burden. As a figure by itself, it can be very misleading if causes for dollar variation are not made clear. In reports to management we tried to tell the real story which points out the causes and sources of the difficulty. Manufacturing burden is that portion of factory expense allocated to the cost of production. Total direct labor at standard cost was multiplied by a standard burden rate for each department. Differences between actual expenses and burden applied were analyzed by means of variance accounts and charged back to the departmental supervisor, so that it was possible for him to know the amount of his controllable expenses exceeding the operating budget.

Unabsorbed burden in the conventional type of manufacturing burden statement is really a composite figure—a mixture of costs which show a net result. In this particular instance there were at least two identifiable causes. First, the indirect expense exceeded the budget. Second, there was an extra burden caused by excessive direct labor. Because this is usually not isolated, management ordinarily would not even be aware of it as additional burden cost.

The Story Is Relevant Today

A reader of this paper may pose the question, "Why discuss the application of cost accounting principles applied during war to a peace-time economy?" The

answer, I believe, lies in the proposition that any cost accounting system which affords management a sound basis for the reduction of operating costs is of immeasurable assistance in providing a better basis for a realization of profits. There could hardly be a better demonstration than that, during a period when tremendous emphasis was placed on production at any cost, the selling price of the product with which these pages have dealt was reduced from $6,000 to $1,600 per unit. It was also a period of high taxes and renegotiable profits. How much more possible it is today, therefore, to plan for profits with similar techniques, when lower taxes allow a greater share of the fruits of our efforts and how necessary such planning continues to be when we are confronted with increasing material and labor costs and the reality of rising competition.

I have attempted in this case study to demonstrate that a well-organized cost accounting program is of great assistance in coordinating manufacturing activities and in furnishing management with operating reports and budgets directed to the improvements of the performance of supervisors and operators. The cost methods outlined focused the attention of management on excess costs as these costs were incurred. Through the use of the departmental operating statements it was not necessary for management to discredit the products produced with the onus of unescapably high cost. Instead, executives were able to look to the source of the problem and deal with supervisors who had it within their province to rectify poor operating conditions and improve performance. For it is only by assigning the causes of excess cost to men and methods that management is able to take constructive action.

As this principle of placing the responsibility for excess costs with men is applied to the operation of business, management will find itself on firm ground to combat competition with reduced costs and lower selling prices, with the assurance of better opportunities for a continuing profitable operation.

Some Fundamentals of Costs for Pricing

by H. T. McANLY

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A resume of considerations relative to the development of product costs for pricing, this paper touches on the effect of competition, relative product conversion time and industry-wide practices on price-determination. Stress is laid on the necessity for costs which provide for all processing losses likely to occur and which are stated at current levels.

IN THE PLANNING of a pricing structure, we are dealing with the future. Cost information relating to current or past operations cannot be used in planning for the future, unless the future operating conditions and price levels are expected to coincide with the present or the past. Thus, it should be obvious that the costs of individual products used in pricing policies must be based upon contemplated commitment prices for materials, contemplated wage scales and contemplated budgeted burden rates which contain adequate provisions for all expenses expressed on a contemplated cost level basis. In order that all operating costs will be provided for in the pricing structure at the same dollar level, the provisions covering depreciation of physical properties should be computed on a current replacement cost basis of all items in actual use.

Keep Costs for Pricing Inclusive and Current

Sound pricing policies are based upon planned specification costs of the individual products which are all inclusive and which have, as part of their content, average provisions for unavoidable losses which are always present. The product costs should likewise include, besides production costs, the costs of developing and marketing. Development cost may be determinable for a specific product, or it may be a combination of both specific and general development costs. The cost of marketing includes commercial administrative and general selling expenses applicable to all products, direct advertising and servicing and guarantee costs applicable to specific product classifications, and direct selling expenses occasioned by the particular channel and classification of customer through which an item is marketed.

Among the production losses which have been mentioned as requiring provisions are those occasioned by unavoidable short runs resulting in excessive labor costs from relatively high set-up time, excess costs due to the use of non-

preferred equipment by reason of unbalanced shop conditions, the excessive time consumed by untrained shop employees, and also the excessive time occasioned by defective material, tool trouble, equipment trouble, etc. The provisions will not represent specific costs of items which may be in production when these conditions occur but rather, normal amounts provided as indirect costs. It is immaterial whether these amounts are incorporated in the burden rates or applied as separate items of operating cost.

Costs for pricing must be current costs. When changes occur in quantities of material, in processing or fabricating time, or in cost rates, because of changes in product design, in method of manufacture, in material prices, in occupational wage scales or in the value or quantity of the elements covered in the manufacturing and commercial burden provision, a new planned cost of the item must be computed.

Thus cost for use in pricing policies is based upon the materials required as determined from the engineering specifications, formula mixtures, etc., at current prices in effect or contemplated to be in effect, the processing time as planned in manufacturing, extended at contemplated labor and burden rates, and the applicable marketing, administrative, and development costs.

Completed product (or assembly) costs should be summarized in such a manner as to disclose separately the cost of materials involved, the amount of direct labor, and the amount of burden classified by the respective manufacturing and commercial burden rates used in product costing. The make-up of each burden rate should disclose the portion representing indirect labor. All make-ready or set-up time should likewise be segregated so that the effect on cost of changes in planned production quantities of specific items can be readily calculated. With such a detailed analysis of the cost content of an item as to material, labor (both direct and indirect) and with other burden separated as to variable and fixed, it is possible to immediately give effect to any changes in price levels and rate of normal activity affecting the individual product cost.

Apply Burden to Products on Practical (But Accurate) Basis

The extent to which manufacturing expenses need be broken down by operations, production centers, or departments for developing product costs for pricing depends upon the relative diversity of the operations involved in the manufacture of the various products. Although, in theory, each machine tool has a specific burden rate based upon the investment, floor space, maintenance, tool expense, etc., in practical application an operating condition in which most processes or operations are common to all final products may preclude the necessity of developing a large number of burden rates for product costs.

In carrying this burden to products, it should be applied on the basis of the relative plant capacity consumed. Thus it may be applied as a rate per machine or equipment hour or as a price per manhour if manhours coincide with the required time of the process or as a percentage of direct labor (for convenience) if direct labor hours parallel the process hours and the individual labor rates per hour do not vary widely within production centers. Substantial accuracy of application is important. For example, expenses incident to planning, receipt, storage and handling of materials, semi-finished products and finished products can be separately provided for on a weight or percentage to material value basis, when the inclusion of these expenses in processing burden would distort their proper application because of wide differences in the proportions of material and conversion cost content in the individual products.

In determining—by products—the gross margin sufficient to absorb general fixed administrative and general selling expense and provide a reasonable profit, consideration should be given to the turnover of working capital in relation to manufactured cost of product sales and the turnover of the investment in physical properties in relation to the value or hours of the conversion cost produced. In other words, relative profit margins in planning of a pricing structure should provide for greater profit percentages on products which require relatively large amounts of conversion time in their production.

However, it must be recognized that uniformity in cost application within an industry is extremely helpful in the direction of making prices comparable. Such comparability may sometimes prevent general lowering of a competitive price structure. From this point of view, it is important to point out that application of administrative and general selling expenses on a turnover of working capital and plant investment basis may not coincide with the practices generally used within an industry and consideration must be given to the more commonly used methods of spreading this type of expense over the units produced.

General administrative and general selling expenses are usually fixed continuing expenses which bear no direct relationship to total manufactured product cost or any element in it. If the company produced a single product, these expenses could be spread uniformly over the units produced. When several products with different specifications are produced, a weighting factor is required to reduce them to a common denominator. In some industries the products may be converted to a unit equivalent based upon the relative plant output per hour. In the vast majority of cases, a unit equivalent is not available and total manufacturing cost is considered a reasonable weighting factor. Where a bottleneck process exists through which all products must pass, the portion of conversion cost which reflects the relative portion of plant output

required by each product, presents a sound weighting factor to bring all products to a common denominator. Thus under these circumstances, the material cost element, which could vary widely, should not influence the application of the general expenses. (Of course, if the material element were in the same approximate proportion to total cost in all products, the use of total manufactured cost would produce the same answer as the use of conversion cost only.)

From a pricing viewpoint, certainly, cost accounting in the future must place greater emphasis on the cost of distribution. Quantity discount policies or rebate provisions should be based upon the relative cost differentials involved in dealing with the various classes and size of customers.

Many sound pricing structures exist which can be justified by differences in costs. There is no reason for any company to discontinue a sound and supportable pricing policy merely because of impending threat of investigation. On the other hand, if the pricing policy is questionable, the price differentials can be revised effectively only through a proper cost accounting analysis.

Use Direct Costs to Determine Margin Contributions

Competitive price conditions may not permit the recovery of full normal product cost. A knowledge of the approximate direct cash outlay incidental to production and marketing will disclose the lowest price at which the item can be marketed with a margin in excess of the direct cash outlay involved. Here is where separation of fixed and variable burden is important. By excluding fixed expense from each burden rate (the expense which will not be affected by the inclusion or withdrawal of the item from production or marketing), a rate can be obtained for computing cash outlay product cost. A knowledge of this cost is ordinarily essential in making sound decisions as to whether a part should be purchased or manufactured or as to whether a losing item should be discontinued before it can be replaced by one contributing more margin.

Here, it seems to me, we have the real value of the direct costing idea. Direct costing places emphasis on the presentation of an orderly pattern of a phase of cost procedure which has also been recognized when we are dealing with the influence of volume on costs and profits. However, I would like to touch a little on what might be considered as limitation of this idea in planning pricing policies. (This is also stressed in N.A.C.A. Research Series No. 23 and 24.) The point to be made is that all classifications of operating expense, namely, research and development, manufacturing, selling and administrative, must be provided for as product costs when selling price and policy are involved.

Hence, direct costing has relatively little bearing on the pricing phase of

cost accounting. However, as previously mentioned, when cash outlay costs are needed in connection with the policies to be followed relative to the discontinuance of unprofitable items, then direct costs do enter the picture. Also, when selling price cuts to produce added sales volume are considered, the use of direct costs properly comes into play to measure the relationship of increased sales dollars to the increased cash outlay costs.

Aim to Build Up Profits Sale-by-Sale

The discussion of costs for pricing, presented on the foregoing pages, may be summarized quite simply. Information on product cost furnished to the management for consideration of selling prices and policies, should always represent the planned cost so that it may know in advance the relative profit in the respective items as they are planned for future markets. Cost information needed for this primary use—pricing and planning—cannot be obtained from the historical records without adjustment to cover probable changes in cost levels and in contemplated operating conditions.

Further, these costs, when known, should induce appropriate action. If the planned cost of a product shows insufficient net profit when compared with an acceptable selling price, changes must be made, as far as is possible, in the overall planned activity so as to reduce burden costs or in product design or method of processing so as to reduce material cost or time required in manufacture. The relative margin of profit contribution over the final direct cash outlay cost will determine the desirability of keeping unprofitable items in the line to the extent adequate capacity exists for their production and marketing.

Certainly no greater profit can be expected to result from operations of the business as a whole than that which is contained in the sum of the individual transactions. Our job in this phase of cost accounting—the offering of maximum assistance in pricing—is to project in advance the net profit margin after recovery of full cost on a current dollar basis, which are provided for in the selling prices at which the individual items can be marketed. If this is well done, the stage is set for better pricing—and selling—policies.

The General Ledger as a Tabulating Application

by WILLIAM L. VICK

Controller's Staff, Stromberg-Carlson Company, a Division of General Dynamics Corporation, Rochester, New York

The use of tabulating equipment for general ledger work is not generally thought practical. A concise example of a system presently in use is offered here, with a detailed flow chart.

THE DEVELOPMENT OF MACHINE methods has gradually pushed manual methods into the background in many areas of accounting and statistical work. In the past, the general ledger has been a stronghold for the advocates of manual operation but now ledger accountants also are succumbing to the attractions of the mechanical processes. The economical use of tabulating in this application has the same general requirements as in other applications:

1. A sizeable volume of work both as to accounts and to entries, or transactions.
2. Multiple uses for the punched cards, such as expense reports, analyses, and sub-ledgers beside the general ledger.
3. Proper scheduling in tabulating and accounting departments.
4. Close-knit organization and harmonious relationships among the departments involved.

Designing the Journal Voucher Form

The journal voucher form for use in the application should be designed along simple lines, so that the entry may be composed and read with ease. Usually the account number will be adequate without a written description of the formal account name. Exhibit 1 shows an example of such an entry. Considerable care is required in the routing and handling of journal entries, inasmuch as in this application at least three groups must handle the original: accounting, key punch, and machine sections. In the hustle of everyday work, matters can get quite confused unless clear interdepartmental understanding is established at the outset. The most satisfactory method seems to be to designate one individual in each department to be solely responsible for receipt and processing of entries in his department and for handing entries on to the next group, with overall responsibility for the closing delegated to some one individual. Our method includes registering the total debit value of each entry along with its number. The tabulating section then must match the sum of these values in its listing to verify correct punching as well as receipt of all entries.

It may be found expedient to assign permanent entry numbers to each type

FORM OF JOURNAL ENTRY

STROMBERG–CARLSON COMPANY

account name	account no.	debit	credit
	per tabs	14 401 07	9 [illegible]
	14020-161	1 263 47	
	14031-161	1 145 35	
(Optional)	15043-161	573 20	
	16015-161	248 93	
	16037-161	2 110 35	
	3110		[illegible]
	3114		[illegible]
	3117		1 007 [illegible]
	3121		[illegible]
	3222		[illegible]
	3317		[illegible]
	3412		[illegible]
	3413		[illegible]
		19 745 37	19 745 37

To record departmental supplies for the month of November

by T. B. Jones

page 1 of 1

19 month

Journal voucher no. 126

Form 3815

EXHIBIT 1

of entry so that, for example, the entry for supplies drawn from stock will appear under the same number each month. An index to journal entries can thus be issued at the first of each year to replace the explanations which were written in manually posted ledgers but which are not practical in machine methods. By numbering the regular, or repetitive, entries at intervals of five or ten, it is possible to leave plenty of room for occasional supplemental entries, thus keeping all entries of a given type in the same numerical group each month.

Costing for General Ledger Totals; Physical Form of the Ledger

The principal point to bear in mind with respect to accumulating machine totals for the general ledger accounts is that there must be a logical build-up in the numerical control series, from the lowest echelon of departmental numbers to their respective control accounts in the ledger. For example, if Department 14 is a press department grouped with four other departments to form a

cost center in the manufacturing division in the Kansas City plant, the number assigned to department 14 might be 78314, where 7 represents the plant, 8 the division, 3 the center and 14 the department number. The tabulating section can than make up reports at any stage desired, from general ledger (controlling on the first digit) to departmental (controlling on the fourth and fifth digits). This is a familiar principle and can be expanded or contracted to suit companies of any magnitude. Exhibit 2 illustrates this technique applied to an inventory control account for the telephone division, there being a large number of subledger accounts whose first two digits are "31." Expense classifications, frequently expressed as hyphenated suffixes, present no problem.

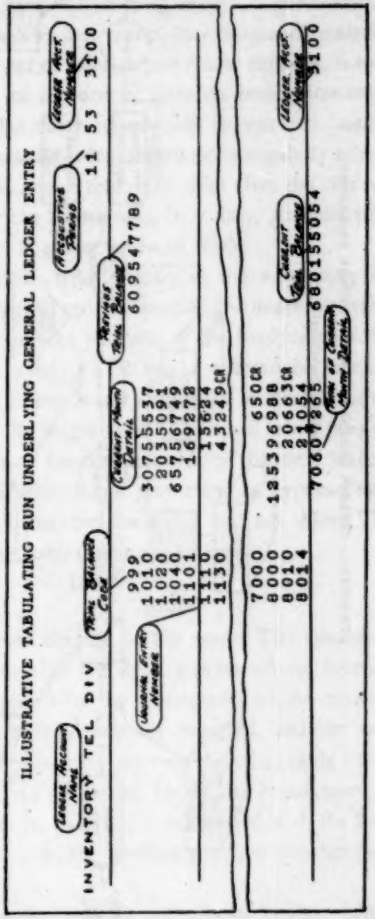

EXHIBIT 2

A complete ledger is produced each month whether or not there is activity in each account, so that, by collating the new month's ledger sheet with the old one for each account, complete year-to-date activity is as quickly available as in the manually posted method. Maintaining the tabulated general ledger is a relief from the problem posed by the manually posted type. No longer are there ledger sheets which are dog-eared and soiled from repeated handling. Likewise, the giant-size ledgers are gone. There are numerous standard binders on the market designed for tabulating sheets. To avoid the bulkiness characteristic of large manually posted ledgers, it is advisable to produce ledger sheets on eight inch and ten inch stock, and file in two inch capacity binders. These are easy to handle and allow more than one person to work on one or more ledger accounts conveniently at the same time.

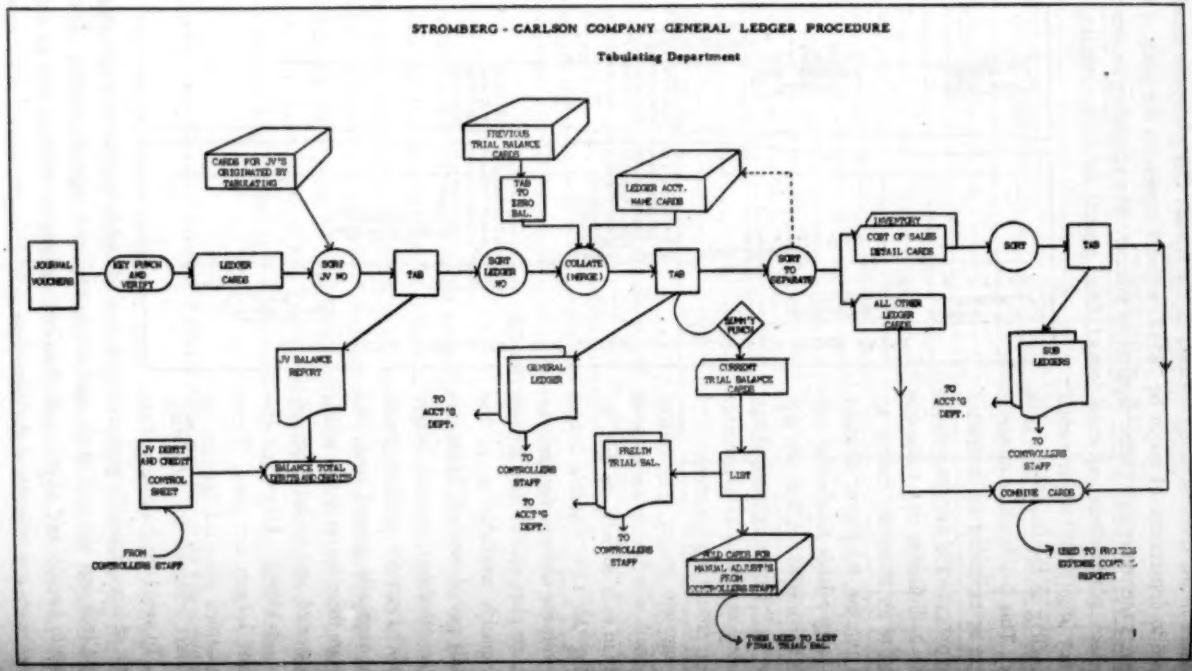
STROMBERG - CARLSON COMPANY GENERAL LEDGER PROCEDURE
Tabulating Department
JOURNAL VOUCHERS
KEY PUNCH AND VERIFY
LEDGER CARDS
CARDS FOR JV'S ORIGINATED BY TABULATING
SORT JV NO
TAB
PREVIOUS TRIAL BALANCE CARDS
TAB TO ZERO BAL.
SORT LEDGER NO
COLLATE (MERGE)
LEDGER ACCT. NAME CARDS
TAB
SORT TO SEPARATE
INVENTORY COST OF SALES DETAIL CARDS
ALL OTHER LEDGER CARDS
SORT
TAB
SUB LEDGERS
TO ACCT'G DEPT.
TO CONTROLLERS STAFF
COMBINE CARDS
USED TO PROCESS EXPENSE COST & REPORTS
JV BALANCE REPORT
JV DEBIT AND CREDIT CONTROL SHEET
FROM CONTROLLERS STAFF
BALANCE TOTAL
GENERAL LEDGER
TO ACCT'G DEPT.
TO CONTROLLERS STAFF
SUMM'Y PUNCH
CURRENT TRIAL BALANCE CARDS
PRELIM TRIAL BAL.
LIST
TO ACCT'G DEPT.
TO CONTROLLERS STAFF
SEND COPIES FOR MANUAL ADJUST'S FROM CONTROLLERS STAFF
THEN NEED TO LIST FINAL TRIAL BAL.

EXHIBIT 3

The Steps from Journal Voucher to Financial Reports

This section of the present paper follows the flow chart (Exhibit 3), which comprehensively shows the procedural relationships involved. The first and longest phase of a closing period is that in which journal vouchers or entries are made up. In companies having a sizable tabulating section, a good deal of the entry information will be developed by this group, including such material as accounts payable, payroll, sales and cost of sales, departmental supplies, manufacturing and purchase variance, costs on job orders, transfers among inventory accounts, and related transactions. This entry information is sent each month from the tabulating section to the accounting department on a regularly scheduled basis, so that it is commonly understood that, in x days after the closing, accounting will have payroll data for the month and, in y days, accounts payable will be ready, etc. This is essential to a smoth flow of work.

The individual responsible for a given type of entry in the accounting department screens the underlying tabulating run for human and machine errors and prepares the entry, giving it the number assigned at the beginning of the year, as has been described. This entry based on a tab run is necessary because the ledger, which is the end-product in this case, is to be made up by the tabulating section and every transaction affecting the ledger must be punched into a tabulating card. However, the tabulating section has only one side of the entry when a run is produced. For example, the tabulating run may show an expense total of $20,000 charged to various departments, but the credit will not show. The accounting department must make up an entry reading as follows:

Dr. per tabs	$20,000	
Cr. stock a/c 3110		$20,000

This supplies the tabulating section with the rest of the entry. The tabulating run, in other words, acts as the support for the debit portion of the journal voucher and the credit portion is supplied by the accountants on the voucher itself. The debit tabulating cards, which are already punched, and the new credit cards are put into a general ledger deck for use with the other cards which will accumulate. Information manually accumulated for entries is processed in the way familiar to all accountants and is, likewise, accomplished with the least difficulty when it is scheduled. In this case, the tabulating section punches both the debit and credit side of the entry.

The first phase of the procedure is over and the second now begins. If the journal entry is based on an earlier tabulating run, the balancing is already accomplished. As a separate step, balancing applies to manually accumulated information which has not been tabulated before. In this case, the tabulating section periodically takes a block of entry cards and balances the debits against

JOURNAL VOUCHER BALANCE REPORT

November 19____

	Voucher #	Debit Amount	Credit Amount
Group	1000	104547901	532931
	1001	3969809	
	1010	62539770	170524549
	1011	367695	367695
	1012	8329412	8329412
	1013	8313151	8313151
	1014	100540	100540
*	1150	6160	1708234
	1160	8330160	8330160
	1161	129630	129630
	8012	544588	544588
	8013	314486	314486
	8014	366329	366329
	8015	260339	260339
	8016	162731	162731
	9010	54989500	54989500
	9011	591966	591966
		3749718146	3751420220
*	"Per Tabs" Value Omitted in error	1702.74	
		37,514,208.20	37,514,208.20

Total Debits Equal Total Credits After Correction * To Tab Cards

EXHIBIT 4

the credits, thus proving punching and accounting accuracy. This is a great advantage over the hand-posted ledger, with respect to which interim proving of the ledger balance is usually impracticable during the course of a posting period. The balanced cards are merged with those originated earlier by the tabulating section in making information runs and, after all entries are in, they are used to compile a tab report (Exhibit 4) of debit and credit totals by entry number. This shows:

1. That total debits equal total credits or, if not, the entries which are out of balance.
2. The register number of all entries submitted and total dollar value of debits, which can be compared with hand-prepared listing kept for control purposes by the accounting supervisor.

At this point, then, we can see that all entry information, whether prepared by the tabulating section or the accounting department, has been punched and balanced. Errors have been screened out and the tabulating section is now ready to produce the general ledger and associated material. Because we can assume

that all trouble spots have been cleared prior to this point of the procedure, this phase goes rapidly. The tabulating section sorts the cards by ledger control number, collates with previous trial balance and account title cards, and then is ready to print the general ledger, sub-ledgers, and trial balance. In our plant, this phase takes less than eight man hours and is done at night, so that the person charged with general responsibility can accomplish the closing by the end of the scheduled day and find the preliminary trial balance, general ledger, and sub-ledgers on his desk in the morning.

This is the stage at which the ledger accountants, theoretically, should be able to proceed with financial reports each month. However, as a practical matter, it is recognized that flexibility must be maintained. So we part company from the tabulating section at this point, as far as the ledgers and trial balance are concerned, and any further changes required will be posted by hand. Nevertheless, the tabulating section will be given these further changes in order to keep in balance with the general books for other purposes, such as expense control reports. In addition, when the ledger is finally closed, the tabulating section will be given a list by ledger accountants of all account balances so that the opening balance in tabulations for the next month on each account will be correct. Generally, the post-closing entries are limited in number and provide only a minor interruption in the process of producing the monthly financial reports.

The most numerous transactions take place in the profit and loss section of the ledger and it is also in this area that the greatest degree of analysis is required. Tabulation cards used to produce the general ledger are well adapted to producing also reports of a highly useful nature, such as:

1. Quick reports on service department expense totals for proration to operating departments.
2. Classifications by type of expense.
3. Departmental expense for overhead study and budgetary control.

Smooth Transition to Tabulated Ledger

In most companies, it may be supposed that transitional difficulties hinder consideration of a tabulating application for the general ledger. However, the change from manual to machine methods can be made with a minimum of upset and error by following these steps:

1. Plan the whole procedure out through conferences among tabulating, accounting, and ledger supervisors.
2. Put the plan into effect in stages, running two parallel methods for two months. Sub-ledgers are a good starting point. Although the double operation may seem wasteful, it is actually good insurance against unforseen trouble and aids in the rapid location of weakness in the new procedure.
3. When the sub-ledgers are "all set" and trouble spots cleared, another section of the ledger, such as expense accounts may be tried, again using both manual and machine methods for two months as mutual verification.

At each stage the original planned procedure can be amended to reflect the experience gained so that, when the final step is taken and the whole ledger process is on the tabulating method, the majority of difficulties have been met and overcome in the earlier trial stages.

Machines Required — and Costs

In our company, the following IBM equipment is used in producing our ledger and related reports:

Machine Number	Description	Hours Required
#024	Key punch	5.6
#056	Verifier	6.5
#402	Accounting machine	5.1
#082	Sorter	1.6
#077	Collator	.2
#514	Summary punch	2.5
	Total hours	21.5

The approximate cost of this work each month is $72, representing $58 for machines, labor and overhead and $14 for supplies. This represents a savings of about $200 a month to our company as compared with the manual method.

Advantages of the Mechanical Process

In our case, we feel that development of a tabulating procedure for the general ledger has resulted in several advantages:

1. The control methods used are more efficient at catching errors before they are buried in a complex of other posted material.
2. The procedure is more adaptable to modern methods. For example, old-style ledgers are frequently difficult to microfilm because of their size and thus have to be stored permanently in their original form. Tabulated ledger sheets, on the other hand, are eight inches by ten inches and easily microfilmed to provide a permanent record.
3. The new method is cheaper where tabulating is already used to any substantial degree. An important by-product is that the mechanical method frees ledger personnel for more important tasks of analysis and of developing and refining data.
4. The use of tabulating equipment combines the best elements of speed and flexibility. Economical use of the equipment and personnel produces the ledger and trial balance quickly, and yet the way is open for last minute additions without unduly delaying the statements or burdening the machine department.

Steps in Developing A Machine Operation Incentive

by RUSSELL P. JONES

Cost Accountant, Wheeler Insulated Wire Co., Inc., Waterbury, Conn.

A group of four wire drawing machines comprises a section for which, as described in this paper, standards were developed and an incentive plan devised, setting 75 per cent of machine potential as "par" and paying each operator a bonus percentage on base pay for production above this level. The presentation thus offers a study in establishing departmental incentives and in labor cost control in the industry.

OUR COMPANY PRODUCES fine copper wire. The wire starts from American wire gauges 24 to 36 (.0201" to .0050" diameter) and reduces it to gauges 30 to 44 (.0100" to .0020" diameter). Four machines comprise a section. Each of the four machines has six "heads" (wire drawing components). Each head may have from four to fourteen dies, each die reducing the wire one gauge size. Each head is equipped with independent take-off spools belt driven. One operator has been considered needed for each machine. In Exhibit 1, there is given a schematic diagram of the machine section, to provide a general picture of the environment of the operation.

From engineering, methods, and production studies we figured that we were only getting sixty per cent of the machine potential. Delay time was high and operator interest seemed to be low. We were not doing as good a job as we thought we should be doing. The time was ripe for a complete study of this problem.

Obviously there are many variables which affect the production on this equipment. Although we had an operator on each machine, we felt that a good operator could manage two machines. Of the wire drawing heads on the machine, from one to six (full number) may be operated at a time, depending on production requirement, etc. The final speed of each head is different, depending on the take-off spool speed. The sizes of wire produced and the capacity of the spools on which it is coiled, are also variables.

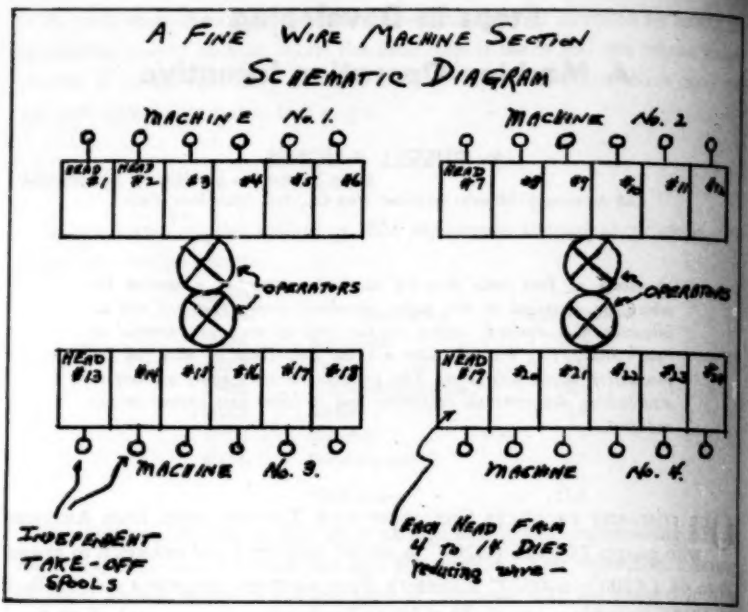

EXHIBIT 1

Development of Production Standards and Allowances

We first made studies of how to improve and control the flow of work to the fine wire machines. We will not go into the detail of this study here, because it does not affect our incentive wage plan. It did, of course, have a material bearing on giving us a chance to obtain maximum machine efficiency. In addition, we examined our maintenance methods to improve the operability of the equipment and eliminate down-time arising from mechanical causes.

We next tabulated machine operating capabilities and limitations. In Exhibit 2 is shown the take-off spool speed for each head on the four machines involved in the study. Because we planned to have fewer operators and an interchangeability of operators on the machines, we decided to treat all heads as a group and use an average speed for all of them. Exhibit 3 summarizes the wire drawing capabilities for each machine head. Here again, we decided to treat the four machines as one area. With interchangeable operators and unlimited work

MACHINE SPEEDS

Mche. No.	Head	Drawing Speed Ft. per Min.	Mche. No.	Head	Drawing Speed Ft. per Min.
1	1	1621	3	13	1582
1	2	1702	3	14	1564
1	3	1544	3	15	1550
1	4	1422	3	16	1562
1	5	1432	3	17	1594
1	6	1418	3	18	1767
2	7	1966	4	19	1462
2	8	1950	4	20	1462
2	9	1966	4	21	1483
2	10	1986	4	22	1519
2	11	1950	4	23	1462
2	12	1986	4	24	1549

Average of (24) machine heads = 1646 Surface Ft. per Minute
Average for incentive plan = 1650 " " " "

EXHIBIT 2

combinations, we did not feel that this would work a hardship on our men. The complications which would arise in administering incentives if we did not consider the area as whole, were very great. As we developed further factors, it became evident that production efficiency (the payment base) would have to be on a group basis.

Our next step was to develop standard setup times and standard scrap percentages. From these studies we determined running efficiency factors for each wire size to be produced. On scrap, particularly, we established maximum limits and told the operators what these were. Any excess meant improper setup and

MACHINE OPERATING DATA

Machine head No.	Wire Size
1 - 6	39 - 44
7 - 12	36 - 40
13 - 18	36 - 38
19 - 24	30 - 36

EXHIBIT 3

RUNNING EFFICIENCY FACTORS BY WIRE SIZE

Wire Size	Run. Eff. Factor %	Wire Size	Run. Eff. Factor %
30 1/2	86	37	92
31	87.5	38	91
32	89	39	89
33	90	39 1/2	85
34	91	40	80
35	92	41	75
36	92	42	67

EXHIBIT 4

were to be referred to the supervisor immediately. (Of course, excess scrap would have a detrimental effect on incentive earnings.) A summary of the standard efficiency factors developed is shown in Exhibit 4.

In working up standards from machine potential, certain allowances were provided. The personal allowance is six per cent. It includes an initial allowance of three per cent for time it is necessary to start and stop the machines and an additional allowance of two per cent to compensate the operator for operating his machines during the lunch period, which is desirable in the wire drawing operation. Another one per cent is provided to cover clean-up time at the end of the shift. No allowance is made for fatigue because there is ample time while the machines are in operation for the operator to rest from any fatigue experienced in servicing and setting up machines. Delay allowance is four per cent and includes the following items: (1) Conferring with supervisor and receiving instructions. Cleaning out plugged dies. Miscellaneous delays: 3%. (2) Machine time lost to short spools (scrap), 1%. Total: 4%. No provision has been made for inclusion of oiling and greasing as a part of the operator's task. This is to be taken care of by the maintenance department on a regularly scheduled basis.

The incentive plan pays a bonus for all good production in excess of standards (shown on Exhibit 5). Standards provided indicated the pounds of wire to be produced to earn day rate or 100 per cent efficiency. These reflect the time studies of handling elements, which resulted in the tables which have been presented. This 100 per cent man efficiency was set at 75 per cent of the machine potential. In other words, our operators were considered to be earning their day rate at 75 per cent machine potential, after allowing for setups, personal time, etc. This provided an amount equal to 25 per cent of the machine potential on which the operator could earn bonus in excess of his day rate.

MACHINE OPERATING STANDARDS

Standards Based on Operation of Ten Machine Heads

Wire Size	Base Hrs. C/lbs.	Std. Hrs. C/lbs.	Extra Machine Head Std. Hrs. C/lbs.
30 1/2	.45	.56	.22
31	.53	.66	.26
32	.65	.81	.32
33	.81	1.01	.41
34	1.01	1.26	.51
35	1.26	1.58	.63
36	1.59	1.99	.80
37	2.00	2.51	1.00
38	2.50	3.13	1.25
39	3.38	4.22	1.68
39 1/2	4.01	5.02	2.01
40	4.84	6.05	2.41
41	6.46	8.08	3.23
42	9.15	11.44	4.58

NOTE: All fine sizes listed above are drawn on 6" spools. If other size spools are used above data will change. Also finer sizes may be drawn.

EXHIBIT 5

Computation of Incentive Pay

To determine an operator's pay, the total earned time is calculated by multiplying the standard hours per pound by the quantity of wire produced during the pay period. The sum of these hours divided by the total hours worked on this incentive for the pay period gives the operator's per cent of performance. An example is:

Total time earned	**288 hours**
Total time applied	**240 hours**
Performance 288/240	**120%**

In this case, a 20 per cent bonus would be paid for the hours worked on incentive operations. If the operator does other than incentive work, it is paid for on a day-work basis. Overtime is based on time-and-a-half of the operator's hourly rate for all work performed.

Inasmuch as incentive rates are based on regular operating conditions and machine production time, no reasons except the following are recognized for ringing onto a day rate ticket:

1. **Major breakdown or power failure**
2. **No productive work available**
3. **Necessary trips to first aid room or doctor.**

A formula for incentive computation of the efficiency per cent for application to the day rate is shown in Exhibit 6. This type of computation is usually

FORMULA FOR EFFICIENCY RATE CALCULATIONS
(AND SAMPLE CALCULATIONS)

Formula:

$$\text{Std. Hrs. c/lbs.} = \frac{\text{Ft/Lb} \times 100 \times (100 / \text{Allow. \%})}{\text{Surface Ft/Min} \times 60 \times \text{Run. Eff. \%} \times 10}$$

Where Ft/Lbs. - No. of Ft. of a given AWG size per lb. of wire.

100 - Conversion factor to obtain hours C/lbs.

60 - Conversion factor - Minutes to hours.

Run. Eff. % - Machine efficiency factor - Reflects percent of total machine time allocated to handling.

10 - Normal operator assignment (10) machine heads.

Sample Calculations

Data:

#34 AWG Wire Size - 8310 Ft/Lb.
Run. Eff. - 91%
Allowance Factor - 1.35

$$\text{Std. Hrs. C/lbs. (\#34 AWG)} = \frac{8310 \times 1.35}{1650 \times 60 \times .91 \times 10} = 1.26$$

EXHIBIT 6

done directly on a tally sheet which is maintained in the fine wire machine section.

There is an opportunity for extra production, which requires explanation. The normal machine assignment was set at 10 machine heads. We expected one operator to handle these heads on two machines. Inasmuch as 12 machine heads are available at any one time, no machine down-time is reportable unless more than two heads are broken down at the same time. It is considered permissible for an operator to run the two additional heads. Whenever an operator runs heads over the 10 head assignment, an additional bonus equivalent to 5 per cent of the operator's hourly rate is credited to him for each machine for each hour these heads are in operation. Credit for the additional bonus is made by applying an extra-machine-head production standard, as shown on Exhibit 5, to the pounds of wire produced. The earned hours, as determined by application of the standard, are added to the total earned hours of the individual producing the wire. (An individual time ticket is required for each extra machine head operated, with the wire size, machine number and amount of wire produced, recorded on the back of the ticket. This is an exception to the group basis of efficiency calculation. All wire produced by the extra machines is segregated and the extra production credited to the individuals producing the wire.)

Company and Employee Satisfaction

Through the operation of our incentive plan in the fine wire machine section, we have increased our machine efficiency by one-half. Our production flow has been smoothed, resulting in a cheaper operation and at the same time satisfying a larger customer demand. A notable reduction in delays and downtime has been accomplished. Our operators take pride, even a proprietary pride, in their work and have substantially increased their earnings. Although this application took some hard work to develop, we are very pleased with the results.

Cost Reporting and Control in the Lumber Industry

by JACK S. PARRISH, C.P.A.

Manager, Management Services Division, Ernst & Ernst, Birmingham, Alabama

An exploration into the utilization of cost accounting methods in an integrated lumber operation is undertaken in this article. A method of establishing cost centers by flow chart illustrated. Examples of financial reports are provided and the use of standards is reviewed.

IN OUR COUNTRY'S early history, there was a profusion of trees, a utopia of fine virgin timber. It was general practice for the logging crews to select only the prime trees for milling and to leave untouched many other trees which should have been cut out under the principles of selective cutting, to permit the growth of the young trees. Planting of seedlings was not even considered, and in many instances, after lands had been cut over, they were deeded back to their original owners or even given to the State to avoid payment of property taxes when cutting was unprofitable. At that time, too, labor and other production costs were comparatively low, governmental controls were nonexistent, and although lumber was the principal building material for all uses, forestry conservation was rarely practiced, and cost controls were unknown in most companies.

A different picture exists in the lumber industry today. Timber prices have advanced with the increasing shortage of merchantable saw timber, and the current inflation in the economic cycle. Minimum wage laws and other causes have spiralled labor costs to an all-time high. Lumber substitutes with many uses have been placed on the market and these substitutes have often met with eager acceptance by a public unwilling to pay the price of better grade lumber. These changes have been counteracted to a limited extent by improved manufacturing processes and forestry methods, but only a few companies have attempted to control their production costs, or to furnish management with proper or sufficient operational reports. Many of the small marginal operators and even some of the large sawmill companies have failed in the past decade.

In this paper, there are set forth the business practices, production and cost controls, and accounting procedures which the elightened management of a large, progressive and profitably operated lumber manufacturing company has developed to meet the growing business problems in its industry. The com-

pany owns its own forest lands and standing timber, has a forestry department, and is completely integrated, conducting logging, logging transportation, sawmilling, drying, and finishing operations. The company also sells part of the logs where their use is more suitable to other operations (such as poles, veneer logs, pulpwood, etc.), contracts logging and sawmilling, and buys logs and green lumber when necessary to supplement its volume.

Development of Cost Centers

The first consideration in the establishment of operating controls and the installation of a cost accounting system is the determination of the points at which controls should be installed. The entire production process must be closely examined and production centers (cost centers) should be established and clearly defined. A flow chart should be devised as a guide and necessary changes which may be considered advisable from time to time should be immediately shown in a revised chart.

The flow chart established for the company under review is shown in Exhibit 1. Cost centers were established for each major operation as set forth in the chart, and necessary accounting records were set up to show as accurately as possible the departmental costs of these centers. Since that time, management has continued to review the chart to determine whether the cost information is sufficient or will be sufficient for proper control of each department. For example, management of the illustrative company considered logging, as a general classification, far too broad for proper analysis of departmental expenses and cost control. Hence, this department, shown as only one division in the flow chart, has since been further subdivided, for increased efficiency and more effective control, into felling and bucking, skidding and bunching, loading and hauling to skidway, and handling and loading at skidway.

The numbers shown on the flow chart are codings for each department or operation. For example, the logging department's coding is 16. The decimal coding classification is used to designate subdivisions of departments and type expense.

Methods of Distributing Service Charges

The number of servicing operations varies with the size and complexity of the manufacturing operation. In the company under consideration, service departments include the following:

Forestry development	Power
Tree farm	Maintenance shop
Material and supply storeroom	General plant

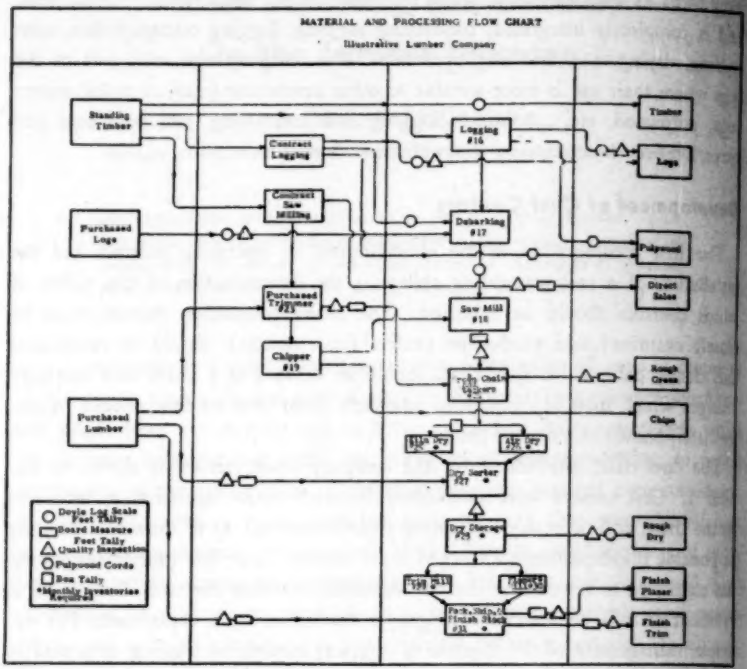

EXHIBIT 1

Each of these servicing departments was carefully studied for costing results, internal control, and distribution. The functions and bases for distribution of these departments are described in the following paragraphs.

The forestry development department's main function is preparing for future production by preserving, maintaining and adding to, if possible, the natural source of raw material, timber. Trees are marked for cutting, cutting records and statistics are maintained, seedlings are planted, the forests are protected from fires and other hazards, non-merchantable timber is girdled, cruising is done for new or prospective timber purchases, and a general program of forestry improvements is carried on. The cost of this department is, in accordance with general practice in the lumber industry, expensed currently by use of a direct forestry account, charging each material pro rata, based on standing timber input into production for the period.

The purpose of the tree farm department is to assist the forestry department when needed and to advise and assist the smaller tree farmers in the area, thereby improving general timber conditions and providing an outside source of supply for future operations. Part of the cost of this department is billed to outside customers and the remainder is transferred to the forestry department.

Operations of the material and supply storeroom department are of the usual nature and costs are distributed by the total cost of requisitions for each department.

The power department uses the waste created by various manufacturing departments as fuel in producing electrical energy and steam for use in other manufacturing operations. Waste is charged to the department at market and credited to the originating manufacturing departments.

The maintenance shop has the responsibility of keeping the large fleet of rolling stock in excellent operating condition. Direct apportionment of time and material is used to distribute the cost of this work and the maintenance cost of each piece of equipment is reviewed continuously for possible savings in efficiency. Job standards supplemented with a preventive maintenance program, enable the management to keep costs at a minimum.

As to general plant expense careful attention is given to charging all possible direct charges to each responsible department. The remaining charges or costs which can not be allocated directly constitute general plant overhead costs, and are spread to producing units on a productive labor hours allocation.

Monthly Cost Statements Supplied

Detailed department statements (Exhibit 2) are prepared to supply monthly and year-to-date production and cost information. These departmental statements are grouped to become the cost of sales statement for the entire company. Exhibit 3 shows the breakdown of monthly and year-to-date data available on the consolidated statement. Wherever the cost of production to a certain stage of process is determined, the comparable cost of outside purchased materials is shown. With this comparative information, management can readily decide upon the level of maximum economic utilization of outside purchases of each type.

Operations are charged with stumpage on a fair market value basis in order to place operational management on a competitive basis and to eliminate the effects of economic increment and natural accretion of timber from operational costs. The amount representing the excess of fair market value of stumpage over its cost is treated as capital gain under the timber accretion provisions

SAWMILL DEPARTMENTAL COSTS

	Month of December *		
	Amount	Per M Feet Actual	Budget
Salaries and labor	$ 6,300.00	$3.50	$3.00
Overtime premium	252.00	.14	.04
Bonuses	180.00	.10	.10
Supplies and expense	450.00	.25	.20
Repairs and maintenance material	1,080.00	.60	.50
Insurance - Public liability and workmen's compensation	144.00	.08	.07
Taxes - Pay roll	180.00	.10	.09
Other manufacturing departments - apportioned	180.00	.10	.09
Power Cost - apportioned	1,980.00	1.10	.95
Garage - apportioned	90.00	.05	.04
General plant - apportioned	540.00	.30	.25
Miscellaneous	-0-	-0-	-0-
	$11,376.00	$6.32	$5.33
Depreciation	3,150.00	1.75	1.55
Insurance - General	540.00	.30	.25
	$15,066.00	$8.37	$7.13
Less:			
Cost apportioned to other manufacturing departments	$ -0-	$ -0-	$ -0-
Cost apportioned to service departments	-0-	-0-	-0-
Cost apportioned to other operating income and expense	486.00	.27	.13
Cost apportioned to capital additions	-0-	-0-	-0-
Slab sales	-0-	-0-	-0-
Billings for services	-0-	-0-	-0-
	$ 486.00	$ .27	$ .13
Total Sawmill Costs	$14,580.00	$8.10	$7.00
Doyle Feet Produced	1,800,000		

* In use, year-to-date columns are also supplied

EXHIBIT 2

of the Internal Revenue Code and is separately shown in the financial statements as "other income."

Manufacturing overruns, shrinkages, and losses are clearly shown in the statements, and are compared with pre-determined standards (the development of which will be given some attention in succeeding paragraph) for each operation. The cost of each process and the final cost are compared with a sales statistics report, showing average selling prices for each type and grade of lumber for the current month and year to date. Separate costs are not maintained for the various grades of lumber, as the conversion cost is practically the same

COST OF SALES - STATEMENT CAPTIONS

(In use this is a four - sheet statement in one column for the captions below and with columns for month and year-to-date figures for Doyle feet, dollar cost and actual and budgeted cost per M feet.)

COST OF LOGS - MILL POND
Logging cost:
Company crews:
Felling and bucking
Skidding and bunching
Loading and hauling to skidway

Contract crews:
Regular timber
Salvage timber

Forestry

Cost of Logging

Less cost applicable to log sales

Stumpage:
Owned land - at fair market value
Timber contracts - at cost

Cost of Stumpage

Less stumpage applicable to log sales

Logs purchased - other locations

Severance tax

Inventory decrease-increase*:
Beginning
Ending

Loading and transportation to mill:
Processed logs:
Handling and loading at skidway
Freight and purchased hauling
Purchased logs:
Handling and loading at skidway
Freight and purchased hauling

Logs purchased - mill pond

Cost of Logs to Sawmill

GREEN LUMBER PROCESSING COST
Cost of logs to sawmill: (Over-run current month/year to date)
Sawmill cost
Contract sawmilling cost-direct sales:
Logging and sawmilling
Sawmilling
Stumpage - owned land - at fair market value
Stumpage - timber contracts - at cost
Forestry
Severance tax

Less cost applicable to direct sales of contract sawmilling

Company Sawmill Cost

Cost of Company Sawn Lumber to Green Chain

Contract cost of company processed sales:
Logging and sawmilling
Sawmilling

Stumpage - owned land - at fair market value
Stumpage - timber contracts - at cost
Logs purchased for contractors

Forestry
Severance tax

Total Contract Cost of Company Processed Sales

Green lumber purchased:
Select pine ("C" and better)
Mill run pine
Hardwood

Total Green Lumber Purchased

Green purchase trimmer cost

Cost of Outside Sawn Lumber to Green Chain

Total Cost of Lumber to Green Chain

Green chain, timber ramp, and stackers cost

Less cost applicable to rough green lumber sales

Inventory decrease-increase*:
Beginning
Ending

Less cost of green lumber to finishing

Cost of Lumber to Drying

DRY LUMBER PROCESSING COST
Dry kiln cost
Air dry and yard cost

Inventory decrease-increase*:
Beginning
Ending

Cost of Dry Lumber to Dry Sort

Dry lumber purchased:
Pine
Hardwood

Dry sort cost

Manufacturing shrinkage (December: year to date)

Inventory decrease-increase*:
Beginning
Ending

Cost of Dry Lumber to Storage

Dry storage cost

Less cost applicable to rough dry lumber sales

Inventory decrease-increase*:
Beginning
Ending

Cost of Dry Lumber to Finishing

FINISHING COST
Trim plant:
Cost of dry lumber to trim plant
Trim plant cost

Manufacturing shrinkage - current month year to date

Inventory - decrease-increase*:
Beginning
Ending

Total Cost of Trim to Shipping

Planer mill:
Cost of green lumber to planer mill
Cost of dry lumber to planer mill
Planer mill cost

Manufacturing shrinkage - current month year to date

Inventory - decrease-increase*:
Beginning
Ending

Cost of Finished Lumber to Shipping

Customer finish purchased

Cost of Finished Lumber and Trim to Shipping

COST OF ROUGH LUMBER TO SHIPPING
Green lumber
Dry lumber

Total Cost of Lumber and Trim to Shipping

SHIPPING COST
Rough green
Rough dry
Trim mill
Planer mill

Cost of direct sales of contract sawmilling

Less cost applicable to lumber used by the Company

TOTAL COST OF SALES LUMBER

EXHIBIT 3

for all grades and may, in many instances, be higher for the lower-priced analyses or grades, because of the upgrading methods used in the manufacturing processes.

Management can secure from these statements a complete picture of the estimated final cost of lumber for any proposed stumpage, logging or lumber purchase contract. These estimates may be based upon actual cost for the previous month, actual cost for the year to date, or, as in the case of this company, upon pre-determined operating standards. The management can readily determine before consummating a specific contract whether it would be advantageous to do so from a cost standpoint.

The Use of Budgets and Standards

Only a few companies in the lumber industry have carried cost control to its logical ultimate objectives of providing and using pre-determined standards and budgeting. All too few companies know their own actual historical costs to the extent necessary to enable them to attempt to establish standards, or on even a non-engineered basis to utilize forecasting in their business operations.

The company used as an example in this paper has realized the necessity for budgeting and has established standards for every productive operation and many of the servicing centers. Each month, the actual historical costs determined by the process cost method are carefully compared, not only with the previous month's and other months' actual operating results but also with the established production standards and budget for the month and year to date. These comparisions enable the management to exercise cost control most effectively.

A number of the standards for measurement of efficiency at the various cost centers were difficult to ascertain. For instance, in the logging operation, numerous conditions not brought on by man affect operating costs. Such items as inclement weather, terrain effect, soil conditions, size of trees and scarcity of trees in areas to be logged must be considered in the preparation of the logging standards. These difficulties, although hard to evaluate, can be overcome by proper planning and forecasting. The forestry department must indicate well in advance of logging the areas scheduled to be logged and submit a detailed factual report on anticipated logging conditions in each area. The logging budget was based on per day cost of variable expenses and excess costs incurred as a result of the elements could (and can) be quickly spotted instead of being buried in a mass of figures. All budgeted costs and standards were expressed in cost per unit of production (per M Doyle feet or per M board

feet), as well as in total dollars for each operation and subdivision of each operation.

In order to operate profitably under present day conditions, a company in the lumber industry must know its production costs in advance of actual operations so that it can effectively control these costs. Many operators today are accumulating all of the information necessary to determine costs and control their businesses properly but are not making adequate use of these data. Production costs can be determined by establishing a system of proper coding and detail costing (in many cases without increasing the accounting personnel) and by venturing into the field of budgeting and comparing current production costs with those of the past and with standards of efficiency, thereby controlling the future operations of the business.

Passenger Revenue Accounting for a Transit Company

by W. M. RANSOME

Assistant Treasurer, Dallas Transit Company, Dallas, Texas

As passengers as well as industrial accountants, it is quite likely that readers will enjoy this presentation of a procedure which seeks to streamline and yet keep under control the recording of the flow of fare cash and tokens from fare boxes to deposit and to reflection in the accounts. The everyday circumstances of transit operations is apparent at many points in the exposition.

TRANSIT passenger revenue accounting is the procedure for establishing a control over fares collected from passengers. It includes receiving, verifying and depositing the receipts, summarizing them for general records, and preparing necessary reports for management. It is the purpose of this article to set forth our company's procedure for these functions. However, before describing the procedure, it is necessary to comment on the nature of the business to better understand the problem at hand.

Operator Runs; Fare Structure; Collection Media

Dallas Transit Company operates the mass transportation system serving the city and adjacent towns, an area with a population in excess of 600,000. The company's chief source of revenue is derived from the payment of fares by passengers riding its vehicles. Currently, the company owns 576 passenger vehicles and 602 fare-collecting devices called fare boxes. Fare boxes are individually numbered and are interchangeable among vehicles. The company operates 41 routes or lines. It is deemed necessary to record the revenue obtained on each line and for each type of operation, railway, motor coach and electric coach.

The weekday passenger loads, occurring during the morning and afternoon rush periods, require about two and one-half times as many vehicles as are needed during the other periods of the day. These heavy peaks, over eight hours apart, require over fifty per cent of the operators (drivers) to work schedules, called runs, split in two parts. Thus, a large number of the operators work on two separate vehicles during the day and, in some cases, on two different

lines. Also, a large majority of the fare boxes are used by two or more operators during one day's operation.

Each operator is required to make a separate report covering each fare box used by him and a separate report for each line, if he works on two different lines, even though he may be driving the same vehicle and using the same fare box. As will be explained later, this permits summarization of information by sorting and adding without transcribing. Adding machines are the only mechanical office equipment used. It might be mentioned here that an accounting machine application is under study, to determine whether or not further savings can be effected.

The fare structure is of prime importance when considering an accounting procedure for transit passenger revenue. In Dallas the fare structure is relatively simple. Briefly, it calls for:

Adults	15¢ cash or 1 token to board a vehicle and 5¢ additional cash to cross a zone line.
Children	7¢ and 2¢ additional to cross a zone line.
Students	7¢ and 2¢ additional to cross a zone line.
Transfers are free to all	

Tokens are sold by operators at five for seventy cents or fourteen cents each. Each operator is furnished a change fund to purchase a supply of tokens. (Sales of tokens are credited to deferred income. Income is credited when tokens are registered through the fare box, with contra debit to deferred income.) Students purchase cards good for twenty or forty rides, from special agents. The operator punches the card when presented for fare. No record is made of punches by operator, as revenue is credited at time of sales. Additional fare zone lines are circles around the center of the business district with radii of three and six miles, respectively.

There are many kinds of fare collection and registering mechanisms used by various transit companies. The one used in Dallas is equipped with two non-resetting registers. One called the cash register, records the amount of money passing through. The other called the token register, records the number of tokens passing through the fare box. The registers cycle, respectively at $999.99 and 9,999 tokens. Each time a register starts over, it is called a "trip" and has to be reckoned with in the control procedure. Company rule requires passengers to deposit cash and tokens in the fare box, constructed so that cash and tokens cannot be extracted until they have passed the registering mechanism. The operator then removes them, supplying himself with cash for change and tokens for resale. Most of the tokens deposited by passengers are

OPERATOR'S SALES REPORT

Line: _____ Train No. _____ Fare Box No. _____

Date: _____ Vehicle No. _____ Run No. _____

Detail of Cash Turn-In		Beginning Reading (Recorded By)			Register Readings Cash	Token
Currency	17.00	Jones		Ending	306.94	0443
Silver $		Operator-Name		Beginning	285.46	0423
Halves	5.00			Corrected Reading		
Quarters						
Dimes	4.70	870	459			
Nickels	2.80	Badge No.	Run No.	Net	21.48	20
Pennies	.94			Net From Other Report	6.16	3
		Bluffview				
Total	30.44	Line				
				Totals	27.64	23
		10-3		Tokens Converted to Cash	2.80	20
		Date				
		Corrected Reading O.K.		Turn-In	30.44	3

Acctg. Dept. Use

Relieved by No. ____ Time On Duty

At Barn On 4:21 P.M.

Transfers Lifted 23

Free Tickets Lifted

871 Off 1:10A.M.

Operator Badge No.

Mess

EXHIBIT 1

converted to cash through resale by operators. Thus, the operator's turn-in is largely cash.

It is easy to audit one fare box and record the receipts. Our problem has been to devise a procedure which would require the least time and expense to prove daily the registrations on 602 fare boxes, receive collections from over 600 operators, control the deposit of money in the bank, audit over 600 individual operators' reports and summarize the information for 41 lines and for street cars, motor coaches, and electric coaches separately. Although this paper discusses the procedure necessary to accomplish the functions mentioned above, it does not extend to the recording and developing of related statistics such as miles operated, passengers carried, and hours operated by lines.

Operators' and Cashiers' Procedures and Reports

As indicated previously, each operator prepares an Operator's Sales Report (Exhibit 1) for each fare box used and for each line worked. Subtraction of beginning readings from ending readings produces the net registration, or amount of cash and number of tokens deposited by the passengers. If an

operator uses two fare boxes on the same line, he may bring forward the net registrations from one report to the other on the line "net from other report" and make a single turn-in to the cashier. This reduces the number of turn-ins to the cashier and holds to a minimum the union contract cost covering payment to operators for making reports.

On the line "tokens converted to cash," the operator subtracts the number of tokens sold and adds their value to cash. The last line, captioned "turn-in," shows the amount of money and number of tokens turned in to the cashier. The section to the left, "detail of cash turn-in," is for the convenience of the operator. Also, in case total cash received does not agree with the report, the cashier can easily determine through this detail the denomination which is in error, explain to the operator, and collect the shortage or return the overage while he is waiting. The operator separates his receipts by cash denominations and tokens and places them on a special tray before making his turn-in to cashier. (The section headed "beginning reading" was not on the report when the prior procedure, referred to subsequently, was being followed.)

Each cashier's cage is equipped with a multiple-head coin counting machine. Each head or coin counter counts only one denomination of coin or tokens. The cashier slides the money from the operator's tray into the respective heads on the machine. Each head is equipped with two registers. One is set back to zero before each turn-in and records one turn-in at a time. The other is cumulative and records the amount of money passing through the head of the machine to the money sack below. This dual count saves recounting silver when balancing and preparing the bank deposit.

When receiving a turn-in, the cashier counts currency and enters the amount in an adding machine, then tallies the amount from each re-setting money register to obtain the total of cash turn-in and checks this total with operator's sales report. Also he checks the token register with the operator's sales report. Each cashier must effect settlement of errors at this time, as he is subsequently responsible for overages or shortages. The cashier is not required to audit the sales report otherwise, except to observe that it looks complete. When the turn-in is verified, the cashier stamps the back of the report with a time stamp which records time of turn-in and his identifying number.

The sales report is filed in a pigeon-hole rack by lines. At the end of his shift, the cashier lists cash and token turn-ins by lines from sales reports and enters totals on a Cashiers Daily Recap (Exhibit 2). This provides control for balancing his cash. The cashier may hold some of the tokens received, for future sales to operators by buying them with his working fund. Space is provided for this conversion of tokens to cash on Exhibit 2. Each cashier prepares

CASHIERS DAILY RECAP

Dallas Transit Company

10-3-1955

LINE NAMES	CASH S.W.R. CASH	NO. 1 TOKENS	CASH E.S.Q. CASH	NO. 2 TOKENS	SUMMARY CASH	SUMMARY TOKENS
Belmont - 7th	137.93	31	1,085.09	271	1,606.60	481
Beverly Hills-Lisbon	187.83	72	846.78	157	1,231.69	295
Bluffview-Inwood	45.82	5	217.32	42	377.61	76
Canada			47.30	4	69.32	15
Cedar Crest			48.28	35	99.51	35
TOTAL PASS. REV.	564.46	191	3,989.28	908	5,987.45	1,321
Reimburse Working Fund						
Sub-total						
Tokens Converted to Cash	26.74	191	127.12	908	212.94	1,321
TOTAL DEPOSIT-PASS. REVENUE	691.20		4,116.40		6,200.39	
Chartered Coach Collections						
Other Collections						
TOTAL BANK DEPOSIT	691.20		4,116.40		6,200.39	

(Typed for legibility. Actually prepared in pencil.)

EXHIBIT 2

his own bank deposit, with is transported to the bank by armored motor service. Errors in deposit are settled directly with each cashier by the bank. Thus the company does not have to recount the cashier's money as was done at one time when cashier's receipts were consolidated into one deposit.

After balancing, the cashier files the operator's sales reports in fare box number order. Each morning the cashiers send to the accounting department the cashier's daily recap, adding machine tapes prepared (by line) when balancing, copy of bank deposit slips and the operator's sales reports. Tokens not converted to cash are sent to the accounting department for return to the company vault.

In The Accounting Department: Fare Box Control to Cash Deposit

The first phase of the work performed by the accounting department consists of establishing control over the amount of cash that should be deposited and the number of tokens that should be received in the company's vault and reconciling with the control prepared by the cashiers over bank deposits and tokens sent to the general office. The first operation requires the proving of the register readings and the net reading on each operator's sales report, then adding the net readings to obtain the grand total of the amount registered.

For years this company, like most transit companies, used special employees to read each fare box at the end of each day's operation to obtain a master control over the operator's register readings. Large sheets, each with spaces for forty fare boxes, were used to record readings and net registrations for this

purpose. This required the equivalent of over two and one-half full time employes, which cost about $11,000 per year. It was deemed desirable to develop a system under which the master control readings could be eliminated without sacrificing any portion of the control previously established.

In the prior procedure, an operator filled in both the beginning and ending readings on his sales report. Except for cases in which one operator relieved another on the line, he never knew what the preceding operator had recorded on his report as ending readings for the fare box. The first step in the revised procedure was to provide a method for each operator to check the ending readings of the previous operator. This was accomplished by requiring each operator to copy his ending readings on a blank sales report on the beginning line and leave it in the fare box. This operator also filled in the section of the report headed "beginning reading (recorded by)," information needed in auditing when there is an error in a beginning reading.

When an operator takes charge of a fare box it is his responsibility to immediately remove the sales report left by the preceding operator and verify the beginning readings shown with the box registers. If the readings do not agree, he enters the present fare box readings on the line "corrected reading" and calls a company designated employee to verify his readings before starting on his run. This employee checks the readings and initials the sales report on the "corrected reading O. K." line in the center section. No erasures are permitted on the beginning line. If the beginning readings indicate an erasure, the operator obtains a "corrected reading O. K." to protect himself. Where one operator relieves another on a line, the new operator checks his readings before releasing the old operator.

In order to maintain a register control in the accounting department, it is necessary to determine the last or highest register readings for each box each day, also, to locate quickly for listing purposes the readings for fare boxes not used by operators that day, and to check readings periodically on all fare boxes not currently in use.

To locate the last daily readings on each fare box, the operator's sales reports are inspected visually and a red check mark placed on the sales report containing the last reading. Due to the number of errors made by operators, it was found expedient to visually compare the lowest beginning readings for each fare box with a listing sheet made of the ending readings on the preceding day. Also, if a fare box was not used (no sales report) a pink slip, slightly larger than a sales report, is inserted in the sales reports to denote this. The visual check also discloses errors in fare box numbers reported by operators and filing errors made by the cashiers.

Dallas Transit Company

FAREBOX REGISTER READINGS LISTING SHEET

Date 10-3 1955

BOX NO.		CASH Final Readings		TOKENS Final Readings		CASH Sales Reports		TOKENS Sales Reports
26		306.94		4.43		21.48		.20
27		331.70		8.88		6.16		3
28	T	4.06		77.76		10.42		.32
49		814.91		32.18		37.66		1.18
50		632.77		59.26		37.65		.93
						10.94		8
		12,067.04	T	999.02	T	28.95		.53
Trips		1,000.00		100.00		15.82		.47
						10.45		.30
		13,067.04	T	1,099.02	T	8.55		.30
		12,385.69	-	1,082.79	-	32.19		.94
						41.56		.86
		681.35	T	16.23	T	12.34		.15
						21.48		.28
						681.35	T	16.23 T

Added by: L. D. P. M. Readings Checked L. D.

EXHIBIT 3

The next step is the listing for the current day of the highest ending readings and net readings from the sales reports. The procedure required equipping adding machines with carriages and designing a form so that highest ending readings can be listed opposite pre-printed fare box numbers. The first two columns on Fare Box Register Readings Listing Sheet (Exhibit 3) are for this purpose. These sheets provide for listing and controlling fare boxes in groups of 25. They are prepared on a mimeograph, hence, are relatively inexpensive. Ruling is such that they register properly on the adding machine. Where there is no sales report for a fare box, the reading is picked up from the listing sheet for the preceding day. After listing ending readings for the 25 fare boxes, the adding machine is sub-totaled, "trips" added, sub-totaled again, and the preceding day's sheet total subtracted to produce a control over sales reports net readings for the group of fare boxes. The same operation is performed for token ending readings in the second column of the form. The reading controls in Columns 1 and 2 of Exhibit 3 should agree with net readings listed from the sales reports in Columns 3 and 4 for cash and tokens respectively. If the totals do not agree, errors are located and listing corrected. Any error found on an operator's sales report in this operation or during the

visual check is noted in red pencil on the sales report and a clip is attached to it for recording the error in the second phase of the accounting procedure.

Spare fare boxes may remain idle for some time despite company instructions to rotate them. An error in the ending readings made the last time the fare box was used might remain undetected for some time. To disclose this, once a week all fare boxes not in use during the afternoon rush period are read by designated employees and the readings sent to the accounting department. Each reading is checked against the reading shown on the latest fare box register reading sheet. Thus, every fare box reading is checked at least once a week, either by operators or by this method.

After each group of 25 fare boxes is balanced, a report called daily reconciliation of registered and received passenger revenue is prepared. On this report the amount of cash registered and the number of tokens registered is entered. The number of tokens received in the accounting department from each cashier is lisited, totaled and deducted from tokens registered. The balance is converted to cash and added to cash registered, which produces control over the amount of cash that should be deposited in the bank. The cash deposits of each cashier are listed on this report, totaled and subtracted from the control figure developed above. The shortage (source unknown at this time) in the cashiers' deposits is determined and cash from an office imprest fund, is deposited for this amount, so that total bank deposits each day equal the cash control figure.

This phase of the work must be finished before 1:30 p.m. each day so as to complete the deposits before the banks close at 2:00 p.m. There are five employees in this department. Normally, they complete this phase of the work before 10:30 a.m. On Mondays there are reports for three days to be audited and about six additional man hours are furnished by other clerks to meet the deadline.

In the Accounting Department: Revenue Summaries and Reports

The second general phase of the daily revenue accounting operation performed in the accounting department consists of completing the audit of each operator's sales report, developing revenue by lines, and preparing individual slips for errors made by operators and cashiers.

The operator's sales reports are sorted by lines from fare box number order. The company has two operating divisions and certain fare boxes are assigned to each division. (The sales reports are already separated by divisions which greatly reduces the time required for this sort.) Within a line, sales reports are inspected and in cases in which an operator made one turn-in to the cashier covering receipts from two fare boxes, these sheets are matched before listing.

A listing of the tokens and cash on the "net" line (proven in the first operation), is made and the totals entered on a form called line operation daily summary opposite the captions, "number of full fares registered" and "cash registered." Value of the tokens (full fares) is determined from a chart and entered on the form, then added to cash registered to produce total passenger revenue for the line. In the center section of the form, the number of tokens and cash received by the cashier, are entered from the summary column on the cashiers daily recap. Total value received is developed in the same manner as total passenger revenue above.

If total value received equals total passenger revenue, the line is in balance and all figures on the operator's sales reports and on the cashiers daily recap for that line are assumed to be correct and no further check is made. When the totals do not agree, the difference is recorded on the line net short and has to be located. After all lines are balanced, the line operation daily summary forms are placed on peg strips in groups according to types of operation (railway, motor coach and electric coach). All figures are added horizontally, recorded, and cross-balanced on summary sheets for each type of operation. Side captions on the summary sheets are the same as on the line summary forms.

Similarly, figures on the three summary sheets which have been mentioned are added, recorded and cross balanced on a daily summary of passenger revenue not illustrated here. This form has a reconciliation section in which totals produced in the second phase of the audit are proven with comparable totals produced in the first phase of the audit. Also proof is made to show that control over cash and tokens registered equals the sum of the cash deposits made by the cashiers, plus value of tokens received in company vault, plus office deposit made to cover shortage developed in the first phase of the audit. This form also has a section for proving totals developed for passenger statistics with related passenger revenue totals.

Error slips are prepared in duplicate for each error listed on the line operation daily summary forms and are listed on summary sheets which are prepared in triplicate for each operating division. Error slips and summary sheets are verified by clerk in charge of the imprest fund from which cash was advanced to complete the daily deposit. He retains one copy of the summary sheets to support the disbursement. He charges the head cashier in each operating division with the net amount of the error slips sent to him for collection. Once a week the head cashiers settle their accounts with the imprest fund clerk.

The line operation daily summary forms are filed daily by lines. At the end of the month, certain figures on these forms are added to produce monthly totals of registered tokens, registered cash, passenger revenue and passenger

statistics. Line totals of registered tokens and registered cash are added and balanced with general ledger controls. A journal entry is then prepared to distribute amounts in these control accounts to the various revenue classifications. Also, a monthly proof of register readings is made by subtracting the totals of the ending readings at the end of the preceding month from totals of ending readings at end of current month, plus trips. The result is reconciled with monthly accumulation of net cash and net tokens registered.

A daily service report is prepared showing, for each line, passenger revenue, passengers carried, miles operated, equipment operated and revenue per mile—current day and same day last year. This report is distributed to management and to all personnel concerned with supervision of line operations. Monthly reports are made showing similar information and also showing detail of revenues by account classifications, detail of passengers carried, etc.

Solution of a Difficult Problem in Procedure

All mass transportation companies have the same general problem which exists in Dallas of controlling, auditing, and summarizing passenger revenues. Our procedure has been presented here in the belief that, for a manual operation, it offers several innovations which hold the cost of the work performed to a minimum yet retain the necessary elements for proper cash control and furnishes information desired by management. The equipping of adding machines with carriages to obtain listing of register readings opposite pre-printed fare box numbers was the key to solving the problem of how to eliminate the master control readings which had been used in our prior procedure.

Costing Pre-Cast Stone for Estimating and Control

by D. P. BARTSCHI

General Cost Accountant, Otto Buehner & Company, Salt Lake City, Utah

To most the pre-cast stone industry is unfamiliar to the point of novelty. This may heighten interest in this paper, from which it will be apparent that pre-cast stone is manufactured on a job order basis, and so costed. Industry background and methods used to accumulate the various cost components are succinctly described.

THE ART OF PREPARING a matrix composed of sand, cement and water to be mixed with gravel, crushed stone or other inert materials, all compounded in the proper proportions, was practiced many thousands of years ago. Concrete now being unearthed in the excavation of some of the ancient ruins in Mexico and South America shows a remarkable state of preservation and indicates these early builders may have reached a much higher state of perfection in their concrete and masonry work than we have since attained.

The use of pre-cast concrete (pre-cast stone) has gained tremendously in comparatively recent years. Precasting stone simply means that the concrete mixture, while in a fluid state, is poured into a mold and allowed to harden or set. The mold is then removed. The resulting product may take an attractive finish on all surfaces exposed to view. The finish may be tooled with a small airdriven chisel, resulting in a delicate pattern of grooves and channels, or it may be "washed" with muriatic acid to "etch" out the finer aggregate to expose the large chips of translucent onyx or quartz. The surface may be polished with a fine abrasive to produce a gleaming mirror-like finish which is equal or superior to many natural marble surfaces.

Within certain limits, the compressive strength, absorption, and density of pre-cast stone may all be controlled in the manufacturing process. Furthermore, the precasting process permits an extremely wide latitude in the design of shapes, curves, and ornamentation for structural and design purposes. Modern day usage of reinforcing steel, prestressing and tensioning processes, and the use of such materials as plywood, latex rubber, etc., for molds has aided considerably in the manufacturing of pre-cast stone for use in the construction industry of today.

Making and Measuring the Bid

The accumulation of production costs in the manufacture of pre-cast stone on the basis of fixed-fee contracts offer some interesting and rather complex accounting problems. The fact that many large projects are bid many months

JOB ESTIMATE

Job No. 9916 — Job Name

Lin Ft. — Weight 28500

Sq. Ft. 76-0 — Mileage—Round Trip 6 Miles

Cu. Ft. 19-0

	ESTIMATED					ACTUAL				
	UNIT	HRS.	@	AMOUNT	TOTAL	UNIT	HRS.	@	AMOUNT	TOTAL
Direct Labor:										
Drafting		5	2.14	11 00			6	2.08	12 48	
Pattern		43	1.85	80 00			48	1.82	87 36	
Casting		22	1.72	38 00			18	1.66	29 88	
Tooling		6	1.74	11 00			7	1.74	12 18	
Polishing										
Etching										
Cutting										
Loading		2	1.69	4 00			1	1.65	1 65	
Total Labor		78			144 00		80			143 55
Material:						Recast (1)				
Cement				8 00					10 00	
Aggregate				5 00					6 00	
Steel				6 00					7 50	
Anchors										
Total Material					19 00					23 50
Burden:										
Plant Burden	50 %			72 00		48%			68 90	
Admin. Burden	50 %			72 00	144 00	49%			70 34	139 24
Total Plant Costs					307 00					306 29
Plant-Profit or (Loss)					76 00					76 71
Plant Sale Price					383 00					383 00
Haul - (Cost)									4 00	
(Sale)					5 00					5 00
Total Sale Price					388 00					388 00
State Sales Tax					7 76					7 76
Total F.O.B. Sale					395 76					395 76
Installation:										
Labor										
Travel Time										
Board & Room										
Mileage										
Setting Mat.										
Permit & Scaf.										
Install. Costs										
Burden	%					%				
Total Install. Cost										
Profit or (Loss)										
Total Install.										
Total Billing										

EXHIBIT 1

in advance of the awarding of the contract and that it may be many more months before the stone is manufactured may prove to be a real concern of the stone manufacturer if there is any great interim fluctuation of his labor or prime materials costs. Escalation clauses are not normally found in his subcontract.

The bid is worked up on the "take-off" from the general plan and specification. This "take-off sheet," should show clearly the general plan and specification of the stone, the individual shapes and sizes and footages required, along with the per foot price bid, all summarized in total for the project. The per foot price may be in terms of a square, cubic, or lineal foot, depending upon the nature of the stone required. Generally, the footage units applicable to various types of items cost are as follows:

Square foot	Cubic foot	Lineal foot
Facing slabs	Structural members	Sills
Panels	Beams	Coping
Roof floor slabs	Columns	Window Sills
		Lintels
		Roof floor joist

When the total footage required by the contract has been determined and the per foot prices extended, the various shapes and sizes of stone are reviewed and a predetermined labor value for each manufacturing process is assigned to each grouping of similar stones. This value represents a manufacturing standard or a modified system of standard costs for each process. A further summation of these values makes up the detailed estimate for the entire job, showing estimated costs, burden and profit, as well as the allowable time for each process (Exhibit 1). The final figures are subsequently inserted for production analysis and for comparison to original estimate.

For cost comparisons during production, the actual performance may be measured against the allowable standard. A daily shop report showing actual versus the allowable standard permits comparison of the departmental performances on each job, as well as the efficiency of the complete manufacturing process. Such progressive comparisons may prompt changes in methods and procedures during the course of production if the customary processes are found to be producing undesirable results.

Charging Direct Labor to the Job

Actual hours of direct labor are summarized daily and posted to each job cost sheet. Workmen complete a daily time card which shows the workman's name, clock number and department assigned, "in" and "out" clock time with the resulting working time, and the time assignable to each job worked on and the type of work performed. Indirect time, vacation time, sick leave, etc., are also shown on the daily time card.

Workmen are grouped in production and service department centers. However, to equalize work forces and meet the demands of special orders, it may

become necessary to transfer men from their group. Actual hours are recorded daily and a redistribution of hours and amounts made for each pay period. Premium pay is prorated to direct labor costs, as well as indirect costs, by averaging the hourly rate in each department. After the necessary interdepartmental transfer of hours and amounts are made, the departmental rate is recomputed and weighted for a ten-week period, to establish the departmental rate to be used in applying direct labor cost to the individual job.

The departmental rate, thus computed, is applied, at the completion of the job, to the total hours of direct labor recorded on the job cost sheet. This has the effect of valuing the labor inventory on a "last-in-first-out" basis. Premium pay for overtime or other cause is not a direct labor cost. We think direct charging of premium time would distort costs of the job which might just happen to fall into the hours worked at premium time rates. Such a "loading" of these jobs would nullify any attempt at a standard cost comparison.

Prime Material Costs Determination

Prime material costs are summarized, in the first instance, from drafting department shop tickets. These tickets display a complete diagram of the work to be done and show stone details, dimension and volume, type of material to be used, type and area of surface finish, steel reinforcing, lifting loops, and any special material required. Steel usage is apparent from the shop ticket which shows a complete detail of the reinforcing structure. Any partial fabrication of material made by others and used in our process is charged directly to the job. "Remake" or "recast" stone is run through the plant on "recast" tickets from which the cost of rejects or spoiled work is computed.

Quantities used are derived from the foregoing descriptive data, together with related compounding formulas. The bulky nature of the principal materials used—sand, gravel, cement, aggregate, etc.—is such that the usual stores requisitioning procedure is not considered practical. Instead, the material is drawn from the stockpile according to a regular batch compounding formula. A summarization of the number of batches mixed for each formula readily give the cost of the materials used in any given period or for any certain job.

Distribution of Plant Overhead

As a factor of indirect cost, we have found it expedient and, we feel, reasonably accurate to apply the entire plant burden on the direct labor dollar formula. We believe that, since the labor-material ratio is relatively constant in the production departments, the direct labor dollar formula provides an equitable proration basis.

The Accountant and the Profitability of Productive Facilities

by T. CRAWLEY DAVIS

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That the accountant has the skill and objectivity (if he is true to his function) with which to aid management, with "profitability facts" in perspective, not only when it is proposed to acquire new facilities but also throughout the service lives of these—and all—productive units, is a major theme of this paper which, in addition, emphasizes many accounting and nonaccounting considerations relative to capital investment decisions.

IT SEEMS THAT all too often the accountant either does not comprehend his opportunity and responsibility in the area of capital investment decisions or is satisfied to let these go by default. It is equally true that business managements frequently fail to make use of talents possessed by accountants, which could be of great value in making investment decisions. Condensed into one sentence, the accountant brings to his opportunity for contribution to facility investment decision, skill in analysis and clear presentation of business facts, supported by the indispensable characteristic of objectivity resting upon great awareness that shading or slanting the facts or presentation down-grades his work and challenges the existence of integrity.

In order to bring this discussion into focus, let us consider a going industrial concern engaged in the manufacture of a diversified line of products, which, by virtue of at least partially successful research, has to launch a new product occasionally or, by virtue of growth of population and/or other factors, must consider expansion of manufacturing capacity, or replacement of process with respect to an existing and established product. (Some of these comments will not be broad enough, nor would some be applicable, to suitably cover situations where there is an acquisition of an entire business through purchase or merger.) For present purposes there are four distinct phases to the commitment of capital to a production facility installation. This paper will deal with each in turn and will call attention to what I believe to be the industrial accountant's interest in and relationship to all four.

Prospective Profitability of New Facilities

Whenever expansion of manufacturing capacity for an existing product or the first manufacture of a new product is under consideration, a market survey

is required. Whereas an accountant, in his capacity as such, ordinarily would not supervise or conduct such a survey, he could and should participate with sales management in shaping the depth and scope of such survey as a basis for developing sound estimate of sales potentialities. There is no fixed pattern or standard which will automatically render a market survey adequate for its purpose. The extent to which determination of sales potential should be based on close or full coverage of customer contact or extrapolations based on customer sampling or samplings of the geographical area to be covered, etc., will differ in each case. The quality of a market survey for these purposes is in direct proportion to the skill and care exercised in planning and executing it in the light of the particular facts of each situation. When the data as to sales possibilities (and it is always to be hoped that they can be presented as sales probabilities) are in hand, the sales estimate section of a project paper can be prepared.

Here the accountant should truly begin to function. He should play an important part in selecting alternative volume and price presentations and set these forth briefly, yet completely, and with such clarity that possibility of confusion or misunderstanding will be reduced to bare minimum. In such presentations, all known techniques will be employed at different times to meet different circumstances and to spotlight the all-important points which might otherwise remain obscure. There is nothing more disappointing, nor potentially harmful to sound business operation and growth, than facility project proposals so poorly prepared as to make it necessary for the decision level of management to act upon unclear facts or half-facts.

Having firmed up the sales volume and dollar estimates, it is then appropriate to consider the economic size of the manufacturing unit to be planned and the estimated cost to install. In this area, the accountant is largely in the hands of the construction engineer or the production engineer or both. However, if the unit desired by the engineers appears to leave a large marginal capacity for a considerable span of future years, the accountant might well see the need for presenting alternative economics of a smaller capacity installation. This would be particularly true in the presence of significant exposure to either product or facility obsolescence.

As to the section of the project proposal dealing with cost to manufacture, selling costs, and administrative and other costs, here the accountant is certainly at home. In some instances, he will require assistance of production engineers to smoke out and evaluate alternate processes and alternate raw materials and perhaps direct manpower requirements, but there will usually exist much precedent and much standard with which he is thoroughly familiar, against which to test and evaluate his

own thinking and conclusions. If the manufacturing operation produces joint products or by-products, it may be necessary to turn back to sales management for assistance in evaluating outlet probabilities and possible realizations. The setting of a fair and adequate depreciation rate requires production and engineering counsel to the end that suitable allowance for obsolescence may be integrated into it. Also, burden or overhead costs must be brought into the cost data presentation by means of sound allocation procedures. However, to none of these problems in the cost area is the accountant a stranger. Here, as in the case of sales, the objectives should be to present costs in such detail as to be meaningful and not in so much detail as to be burdensome, to highlight that which should be highlighted and to bring out for consideration variations in costs through alternative processes or through alternative raw materials with the same facilities.

With sales cost data available, working capital requirements can be estimated. This, of course, the accountant would care to leave to no one else. With an estimate of sales, costs, new money for plant and new money for working capital, profit expectations can be evaluated in terms of return on new money investment. Presentation should also be made as to profit return on investment, including suitable allocation of any existing manufacturing facilities and general facilities which will be utilized by the new or modernized operation.

By a very simple chart or graph, it is possible to present profit return on investment at varying operating levels and at varying sales prices, without tedious tabulations of detail to bring out these all-important facts. Such presentation techniques make it possible for the decision level of management to apply its own appraisal of sales potentials if it is thought that too much optimism is built into the carefully worked out and integrated detail. It is also possible to devise and employ simple chart and graph techniques to bring out estimated profit results from alternative processes or raw materials. The accountant should put forth diligent and continuing effort to devise and improve techniques which sharpen the presentations without blurring facts or any essential data.

Profitability of Facilities in Initial Operating Period

Every system of internal financial control should include requirement and procedure for testing profit results from a new facility against the results anticipated at the time the project was proposed and authorized. There is no other management tool so effective in generating a proper degree of caution and realism on the part of operating personnel in seeking for authorization of funds for new construction. While different in form and content, this performance report, which compares fore-

cast profits with actual profits, is not unlike, in purpose and effect, the system of inventory control which forces a periodic comparison of inventory investment with an established standard.

Despite these obvious facts, it is not unusual to find no integrated and firm requirement for testing forecast profits from capital expenditures on the anvil of actual performance after operations begin. The preparation of a project accomplishment or performance report, is unquestionably a proper task for the accountant and one for which his qualifications are well suited. This is so, not only because analysis of sales, costs, and investments data are to be resolved into a clear presentation of performance against forecast performance but because this reporting is, or should be, an integral part of an effective system of financial control. It is a means by which top management can measure the financial fruits of decisions taken at that level.

Two difficulties are usually encountered in the preparation of facility performance reports, i.e., selection of the fiscal period of operations for this test of performance and the inevitable variations between economic and other conditions during operations and those anticipated when the project papers were drawn. These problems have to be met in a practical and common sense frame of mind. The period chosen for testing financial performance should be long enough to smooth out artificialities asociated with seasonal or short-run operations. A full twelve-month period will usually prove sufficient for this purpose. The period should begin to run just as soon as the facility has come through its shake-down or break-in operation. It has even been found helpful to include in the project authorization a statement of the period during which operations will be compared with project predictions. This goes a long way toward removing a point for debate between operating and accounting personnel when the time is right for a performance report. It has also been found helpful to require the preparation of two or more performance reports, properly spaced, if the first one discloses failure to attain forecast profit results by a significant margin.

The variances disclosed between actual and forecast performance must be identified as to source and cause. Here the accountant must beware of pitfalls. Some variances result from differences between actual and predicted sales and costs, while others stem from changes in economic or business conditions occurring after the project authorization and before the test period. Identification and evaluation of cause factors in terms of variations is an undertaking worthy of the highly skilled accountant capable of complete objectivity and the ability to draw from sales and operating personnel facts with which he has had no direct contact but which he must bring into focus in a realistic way. Human relations are involved to an

even greater extent than in project paper preparation. The accountant must be able to achieve this performance reporting task skillfully and accurately, but must do so without strain upon interfunctional employee relations. It is no easy undertaking but it is worthwhile in terms of satisfaction gained in the operation of a system of financial control and in contribution to a sound base for project presentation over a long-term future.

Profitability of Facilities Throughout Service Lives

Two points impress me in connection with the reporting of facility operation. The first relates to the annual depreciation charge and the second to the allocation of overhead to a given operation. Somewhat parenthetically, I would like to comment that I am well aware that, in many instances, it may not be necessary or appropriate to prepare periodic income statements with respect to a specific facility. Questions as to the degree of detail periodic reporting will usually be resolved by reference to the kind of reporting found most useful to management in directing the course of the business. However, all of us know that an accountant would be shortsighted and even negligent if he devised a system of production cost which would not permit ready and meaningful comparisons of cost to manufacture like or similar products produced by different facilities.

To the extent that such reporting is undertaken, the depreciation charge is of great importance. In this era of great technological strides, the probable physical life of a manufacturing facility is usually a secondary element in this charge. What is of primary significance is economic life. How long will the facility remain competitive in terms of product or process? Accountants should not regard the setting of a depreciation rate as a casual function or let a depreciation rate once established become frozen into accounting and thinking. Rather, the accountant should sponsor frequent critical reviews of depreciation and press always toward the side of full depreciation too early rather than too late.

It is worthwhile to take the same general attitude toward allocation of plant and/or general overhead to specific manufacturing operations. The basis of allocation or proration of general expense items is of the essence. A sound basis once established will require careful watching if realistic burden allocations are to result. Changing operating conditions can play havoc with overhead allocations unless these are modernized when required. Unrealistic allocations may result, not only in stating profit results incorrectly but could also result in unrealistic product pricing. We know that a major factor in pricing is the healthy influence of competition, but the long-term vitality of the business cannot be main-

tained if pricing must be done in the absence of sound and accurate cost data. The proportion of cost made up by overhead has been on the increase in recent years and this trend is not likely to change, so be on the alert as to the validity of overhead allocations to cost.

Dealing With Situations of Declining Profitability

It is a stern business fact that most industrial products, at least in their original form, yield a satisfactory level of profits over a relatively short life span. Either the consumer or the competitor, or both, force changes in the product to meet expanding and different end uses or to meet increasing consumer demands for greater utility and satisfaction in existing or new end uses. This is the force of competition at work, the driving force behind technological progress. In a multi-product company, this erosion of product profitability poses a real problem for alert and forward-looking management i.e., how to bring declining profit situations to the surface for critical examination and sound decision upon a course of action when all the facts are fairly laid out. These problems are within the scope of this discussion, inasmuch as they usually bear directly upon facility investments.

Decisions to abandon the manufacture of a product line which is no longer showing adequate profit possibilities are seemingly more difficult to reach than decisions to appropriate new funds to build a plant and it is much more difficult to come to decision to abandon a plant site than it is to discontinue a single manufacturing operation at a multi-product plant site. In either case, sales and production personnel are known to develop a sentimental attachment to operations and products which have been with them for some time and thus strong pressures are encountered for continuing the operation in order to "absorb overhead," "support other lines," live up to "responsibility to customers or employees," maintain "community or public relations," and "avoid loss of company prestige." In the light of these and other recognized problems and points of view, the system of financial control should include a method which will periodically force to the surface the profit facts surrounding low-return facility investments. Extensive product diversification especially demands this aid to top management, because of the greater likelihood that overall profitability of operations will obscure the unsatisfactory profit situations. It should not be overlooked that an unprofitable product or product line, if it cannot be revitalized, draws off talents and energies at all levels in the organizations.

I do not know a standard to suggest for forcing low-return operations to the surface for examination of the financial aspects, except an arbitrary standard. It seems to me that a multi-

product company management should select a profit percentage return on investment below which it will require periodic reporting of all surrounding facts as a basis for specific and intense consideration of the near-and long-term future of that segment of the business. For such reporting, we turn again to the skill and objectivity of the accountant to bring the facts into clear focus, especially those facts which portray profit results from present operations, extraordinary costs incident to discontinuance, and loss of annual profits which might be expected to result from such discontinuance. In some instances, the unsatisfactory profit situation can be cured by change of process or change in some or all of the raw materials or more mechanization of operation. Where these actions are proposed or feasible, necessity arises for careful estimate of plant and/or working capital expenditures to accommodate the changes, and forecast of cost of sales under the new and proposed manufacturing approach.

The accountant must develop a clear and sound concept of method for estimating profits to be lost by discontinuing an operation or differential in profits to be realized from modification of process. In this area one encounters many different and sometimes strongly entrenched views as to the factors which constitute guiding principle as to profit facts, need for and time of discontinuance of a low margin profit operation, or modernization of a process. We cannot examine all the collateral and non-financial factors which must of necessity enter into consideration. Surely business management must have regard for customer relations, employee relations and community relations. The accountant must supply guidance in the matter of profit facts against which these colateral factors will be evaluated. The size of whatever profits there are, measured as a percentage of return on investment, weighs heavily in the total picture.

I have often heard the principle expressed that loss of cash earnings and recoverable capital are the two elements for financial judgment with respect to discontinuance of an operation and that, if these two factors show a return on recoverable capital equal to or higher than that at which recovered capital can be put to work elsewhere, there is no financial justification for labeling the operation unsatisfactory from a profit margin standpoint. The cost in the recoverable and cash basis calculation is relieved of distribution overhead and the recoverable capital is estimated to have a realizable value equal to or less than the working capital portion and even this is reduced by the extraordinary cost of shutdown such as termination wages. With an easy stroke of the pencil, the groundwork is laid for showing loss of earnings which is higher in terms of a percentage of recoverable capital than is earned by most, if not all, of the healthy product lines.

The showing of loss of cash earnings versus recoverable capital may be expected to do more harm than good as the sole profit criteria in these all-important considerations. Yet it cannot be suggested that these data should, in all instances, be eliminated from the picture. The accountant must strive for presentations which hold it in proper perspective. However, I am gradually coming to the point of view that current and estimated future profit position calculated under going concern accounting methods will, on balance, provide more helpful criteria than the cash earnings concept. Therefore, if a given situation calls for a cash earnings and recoverable capital presentation, it seems imperative that this be placed in juxtaposition to the normal accounting evaluation in such manner as to permit appropriate remarks upon the validity of each for the specific purposes under consideration.

In proposed facility discontinuance, the problem of what to do with the undepreciated portion of the investment is usually encountered. I find this a rather simple problem. The undepreciated investment results from mistakes of the past in estimating economic life of the facility for depreciation purposes. We should not let past mistakes color judgment and decisions upon current matters and future vitality of the business. My counsel is always to absorb the loss under whatever current accounting method is appropriate to the situation and get on with the real problem of keeping the business at the highest possible level of earning power.

Needed: Accounting Skill Leavened With Business Sense

All management levels of a multi-product and/or a multi-plant business should draw heavily upon the accountant's technical skills and objectivity in the marshalling and presentation of facts touching upon investment dollars, cost, and actual or predicated profits in making decisions upon new facility investments or upon a suitable course of action with respect to ailing existing facility investments. In addition to possible contributions already mentioned, I believe the accountant can be relied upon to develop uniformity to the extent that this is practicable, in the manner in which capital outlay proposals are presented for review. This makes for ease of comparison of similar data presented at different times and under different circumstances.

The other side of this coin is that the accountant, whatever his title, whose assignment renders it possible for him to make a contribution in this area, should approach his responsibility as an opportunity to be of real service to management and to the long-term vitality of the business entity. He should consider sound and objective presentations of information his peculiar responsibility. He should recog-

nize that great skill as an accountant is important and see to it that he is not lacking in his qualifications and, of equal importance, he must recognize the need for working with persons of other talents and know how to do so. A criticism frequently levelled against accountants is that they are unable to recognize or properly evaluate the non-accounting considerations present in all business problems. The role I have in mind with respect to facility investment cannot be filled by an accountant to whom this criticism applies. It is up to the accountant to demonstrate that he not only possesses the skills and talents of his profession in a specific and technical sense but that he is also capable of translating this know-how into sound application to broad business problems faced by top management. Therein lies opportunity for contribution to the well-being of our industrial economy.

Property Records Have Heightened Relevance Today

by SHORELAND C. MATTHIAS

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Close tie-in between the fixed asset records and the property items, themselves, is advocated in this article, both on conventional grounds and on the thought that the continued prospect of increase in proportionate importance of this classification of assets in the total assets of industrial companies warrants correspondingly increased attention to the accuracy of the related records. Mentioned also, as pertinent, is the place of fixed asset totals in bases used for computing return on investment.

THERE IS NEW INTEREST these days in the handling of fixed assets. The purpose of this paper is to emphasize and develop further interest in this important subject. Property items are more than hieroglyphics or dollar representations. They possess (it *should* be needless to say) physical properties, intrinsic value, and capacity for use for the production of income over a period of time. If the property records are made more accurate and complete at the time of acquisition, the information can and will be used more during the period of investment. If they are not accurate and complete . . . well, even now, nothing is more exasperating than to need information pertaining to an item of property acquired a few years ago and not be able to find the original documents or reference to them—or the item itself!

One special reason why it is more than ever important to know the company's fixed asset picture thoroughly is that more and more companies are measuring profit by relating it to the value of fixed assets employed to produce it. This is the test as to how well the assets were used in the trade or business. There is no greater contribution to mismanagement in business today than to invest company funds in a piece of equipment or property and have it sit idle. This will become increasingly important in years to come, with fully automatic machines, multiple operations, conveyorized lines, mechanical handling, and the magic effect on our thinking of automation.

What to Capitalize

The question of capitalization policy is primary. It determines what fixed assets the accounts will carry. The nature of the business and experience of the company generally will underlie policy as to whether an expenditure is to be capitalized or expensed. However, it is not easy to apply policy.

Rules of thumb can be derived to be used as a guide. Five such rules are:

1. The fact that a request for the acquisition of capital assets is approved does not imply that capitalization is required. Such decisions are accounting ones and, in making these decisions, an analysis must be made of the work orders, purchase orders, and circumstances surrounding the proposed acquisition.
2. If an item will have an estimated life of one year or less, regardless of cost, it is always expensed.
3. If an asset is perishable, extremely small, easily lost, and/or has a comparatively short life expectancy, that is, one to three years, its cost generally is expensed.
4. If an item is identifiable by a machine tool, vehicle, furniture, or other property number, the value and durability is sufficient to warrant capitalization of the cost without further consideration.
5. If it is known that substantial repairs — approximating half or more of the original cost — are customarily experienced within a year or more of purchase, then the cost of the item is expensed.

Again it should be pointed out that these are not precise rules to be followed but rather are guides resulting from experience. Although each acquisition must be evaluated on its own merits, it is important that a pattern of consistency be developed and maintained. In helping to make these decisions, the accountant responsible for property can do much to instill confidence in the subsequent necessary record keeping.

What to Include in Property Records

The nature of the detailed property records, whether tabulating cards, key-sort cards, visible file cards, ring-binder cards, index cards, etc., is not really important, provided they are maintained in the most useful and readily accessible form. What is important is that the property information required to manage effectively the affairs of the company be determined and the method selected which will supply this information at the lowest cost in terms of dollars and time. As practicing industrial accountants, let us not buy a form for looks only. (This short-sighted practice is a frequent one.) Above all, let us recognize that property records must be kept up-to-the-minute at all times. Property records anything but current are obsolete and are of little value to management.

The amount of information carried in the detailed property records will vary according to individual company requirements. There must be a description of the item. It is important that this description be accurate and adequate. If, for some reason, the printed or punched description is limited, there is no reason why additional description should not be added in an appropriate card location by hand, being careful to describe properly the items as invoiced. For example, the description of a machine should be composed of at least three parts . . . general and specific description and make, e.g., grinder (general description), centerless (specific description), and A. B. Co. (make). Model size, horsepower rating, and other pertinent identifying description should be noted for reference.

Property item number should be in

sued to serve the single purpose of identification. All items should display identification tags. The numbers should be assigned at the time approval for purchase is being sought. When a property item is received, the receiving department may be made responsible for temporarily tagging equipment with the identification number (obtained from a copy of the purchase order) and other reference information. After installation, the planning department should affix the identification tag or metal plate. Only when this is done is the temporary identification tag removed. Most permanent tags are simple and carry merely a number. More elaborate tags show item number, name of company, cost, date of acquisition, and a title description. There are advantages to the more elaborate tag. (An incidental one is the benefit of having the workman know the investment represented by the machine on which he works. He will have more respect for it, resulting in lower maintenance cost . . . and a more ready point of reference to the stockholder's stake in the successful operation of the business.) Property item numbers can be issued consecutively or in series. A serviceable set of number series might be as follows:

Classification	Series identification
Machine tools	M-1, M-2, M-3, etc.
Vehicles	V-1, V-2, V-3, etc.
Furniture and office equipment	F-1, F-2, F-3, etc.
Buildings	B-1, B-2, B-3, etc.
Building equipment	E-1, E-2, E-3, etc.
Jib cranes	J-1, J-2, J-3, etc.
Miscellaneous*	Z-1, Z-2, Z-3, etc.

*Small integral machines, laboratory equipment, portable powered equipment, bins, shop equipment, and any other item not properly classified in other series.

A complete numbering system is maintained. If this is done, positive identification and cross reference to property records in the years to come are facilitated. It is easy to abbreviate the procedure and to number only the larger items. The thing to remember here is that little property items in the aggregate soon equal or exceed the value of a large item. From the standpoint of dollars invested and contribution to the production of income, both large and small items are important.

Location data applied to property item records must be specific and current. Too many times our fixed asset records become mixed asset records because accountants are not objective and insistent enough in their views. Whatever is constructed in place can also be transferred, or have the cost transferred, to another plant function, location or subsidiary. Locations should clearly show where the item can be found. A crane may extend over several bay areas but one location is all that is required to find it. Moveable equipment should show storage area locations. Divisional or factory departmental assignment may well be included with the location to supplement

the area location and to make breakdowns possible for allocation purposes and to establish responsibility. Typical three-part location information would include building designation, specific location, and divisional assignment. This might be put together as B1-A63-69.

The importance of current and adequate locations will be apparent to anyone who has handled a fire or other insured loss. Before the loss occurs, little attention may be given to requirements for establishing proof of loss, other than that adequate proof be furnished by the insured and a vague awareness that "certain responsibilities rest on the insured" (meaning—among other things—adequate property records). After the loss, these generalities become quite specific. It is at this precise time that proper property records receive acclaim from all quarters!

There is a still more important use of property location records. How frequently are detail property records tested? Have you recently gone out into the shop and selected a machine, made a note of location, make, model, machine number, and condition, and then verified this information, as well as cost, with the detail property records or, to reverse the procedure, have you taken the detail property records and, selecting an item at random, gone out into the shop and inspected the propriety and and completeness of the recorded information? There is no reason why these tests should not be made every month as part of the scheduled monthly activity of the accountant responsible for property. The location record supplies the means for this check.

It is not likely to be disputed that detail property records should include item cost. Nevertheless, it is not always easy to establish this figure. Particularly during the hustle and bustle of construction, expenditures can be confused and, after transformation by summarization, the costs assigned by item can result in some monstrosities, if care is not exercised. A little forethought on the accounting problems to be encountered at the time the expenditure is proposed will overcome cost determination problems. Budget procedures followed in the acquisition of capital assets depend on accurate costs. These procedures are a means of control and, in most instances, control is based on dollars of cost (expenditures) per quarter or on some projected cost basis. Proper cost determination then becomes part and parcel of control.

Date of acquisition is important to item records, because the cost of the item will be charged to the accounting periods established by the estimated useful life of the asset. There should also be a folio reference to original documents. It can be a journal entry number, work order number, invoice number, or voucher number.

Accounting Angles to Nonaccounting Problems

Every item of property should be someone's responsibility. If divisional assignment is made a part of the location record, this may be taken to establish responsibility in division managers. In the exercise of this responsibility, it behooves the division manager to cooperate with the individual responsible for property accounting to see that each division is charged with all items under its authority and relieved of items disposed of or transferred. Periodically, lists by divisions should be prepared and submitted to the division managers for verification. This responsibility for company property accrues to members of the management staff whose duty it is to determine the need for it. This fixing of responsibility should eliminate divided responsibility and stimulate the respective division managers to see that property items receive the attention and maintenance required for proper operations.

Fully depreciated assets pose a problem. The point to be made is that, although the book value has been reduced to zero, it does not always follow that the usefulness of the item has been exhausted. Fully depreciated assets continued in use are productive and should be maintained in the detail property records, even though the costs and reserves have been eliminated. As long as used, fully depreciated assets have insurable value and this value will be recognized and determined at the time of a loss. Modernization programs and replacement policies determined by higher echelons of management will prevent the extreme continued use of fully depreciated assets.

At the time of acquisition, the accountant responsible for property is informed of the nature of the proposed acquisition. Therefore, when disposition is decided, negotiated, or other commitments made, the accountant should be notified of the contemplated action. Disposition can be by trade, sale, scrap or transfer. Any problems from an accounting standpoint should be discussed with the chief accountant. Any tax consequences of the proposed disposition should be reviewed by the chief accountant with the company's tax staff at the general offices or with the independent auditors if no tax staff is maintained. After the accounting and tax problems have been resolved, the course of action is made clear to all concerned with disposition. Proper disposition is then made in the best interests of the company.

Better Property Records for More Intensive Use

The pace of modern business is fast. The investment in property is too high —and is becoming proportionately higher—to tolerate neglect of the physical property or of the property records. Logically, then:

1. Property is necessary for the production of income.

2. Ownership of property requires adequate records.
3. Profit is related to the management of property.
4. Therefore, good property records result in better property management which returns more profit to the business.

The pursuit of profit requires constant endeavor. A formula for computing the rate of return on investment relates profit for the period to a figure for investment of capital. Proper use of property records also requires constant endeavor. The value of this constant endeavor can be made vivid by the following "picture" bearing the likeness of a formula:

$$\frac{\text{Used by management}}{\text{Property records}} = \text{Efficiency of operations.}$$

With the denominator (property records) remaining constant (for we have tried to establish the value of good property records during this paper), it follows that an increase in the numerator (use by management) should result in an increase of efficiency of operations. The formula is simple and it works to improve profit. All we have to do is to apply it.

Letters to the Editor

COST CONTROL ACCOUNTING FOR PACKAGED PRODUCTS DISTRIBUTION

Editor, N.A.C.A. Bulletin:

LAST YEAR A TOTAL OF two hundred and eighty-five million pounds of packaged merchandise was hauled by the Standard Oil Company of Ohio. The bulk of this merchandise moved direct from the source points to the retail outlets.

One of the important factors of control of this state-wide distribution of packaged products by trailer vans hauled under contract by outside power units was establishing a cost system which included all phases of our packaged goods distribution. The system provides for cost classification into four segments, namely, state warehouse expense, load dock expense, van dray expense and division dray delivery expense. Each segment is then broken down to all functions of cost. Thus, we quickly get an overall picture of our distribution costs from source point to final delivery and can still study each detail which makes up the cost. Separate accounts are established under each category to which expenses are charged in detail. These accounts and the category to which they apply are as follows:

State Warehouse Expense

One warehouse account for each warehouse in operation.

Load Dock Expense

Lift truck expense
Other than vehicle expense

Division Dray Delivery Expense

Dray truck expense
Dray tractor expense
Other than vehicle expense (dray truck operator)

Van Dray Expense

Dray truck vehicle expense
Dray tractor vehicle expense
Switch tractor vehicle expense
Dray trailer vehicle expense (dray truck operator)
Other than vehicle expense (switch tractor operator)
State operating office expense

Monthly statements are prepared for all expense categories except division dray delivery expense. Total expense in each of these categories is allocated to the sales divisions monthly on the respective bases of total pounds warehoused, total pounds handled over the dock and total pounds hauled for each division. This expense then becomes a part of the sales divisional distribution statement which develops a total cost by division of warehousing and distributing packaged products.

Division dray delivery expense covers the operation of power units assigned to each division for the purpose of distributing packaged products within that division. These expenses are charged directly to each division through the use of a division designation in the expense code. In instances in which division equipment is used in an operational manner which benefits more than one division, a dollar value is calculated which is credited to the division's dray delivery expense and charged to state-wide van dray expense. Each month end, the total net expense represents the division's delivery expense and becomes a part of the packaged product distribution expense on the sales divisional distribution statement.

Although we have improved service, cut costs and reduced inventories, we feel we have merely laid the foundation, through our methods of distribution and controls over it, upon which to build a system to meet the "speed at low cost" demand of modern industry.

T. F. BASSINGER

THE ACCOUNTANT IN ADMINISTRATION OF INCENTIVES

Editor, N.A.C.A. Bulletin:

WHEN WE THINK of incentive wage payment plans, we often think first of the industrial engineer whose responsibility it is to set the base standards and to lay down the basic rules under which the plan will operate. In addition to the industrial engineer's work, there is the role of the plant accountant who also plays a vital part.

The accountant who steps into the incentives administration picture must assume a broad interest in it. In analyzing the underlying principles, the accountant will find that the two factors of production and time while on standard are the basic measurements of computing incentive pay. Here his knowledge of auditing will apply. Although the industrial engineer will outline standard practice by which production is to be determined at the various stages in the operation by physical count, the accountant should apply audit checks to determine that the counts are correct.

Reports of efficiency also call for scrutiny. Having accepted the fact that there will be a fairly wide spread of performance levels among a group of operators, the accountant may have a tendency to feel that that is all there is to it and to compute the pay each week and write out the payroll checks without further question. However, even though the average efficiency is in line, it is the responsibility of the accountant, through his assistants who compute the incentive pay, to carefully scrutinize each daily time sheet for errors or deliberate misrepresentation of facts. For example, an analysis of the time sheet may show that, during a certain two hour period, the efficiency in terms of standard hours produced figures out at 200 per cent, whereas the remainder of the day averaged less than 100 per cent. Here is the information known only to the accountant, for published data is on a day's average basis. The accountant should look into the matter further to determine what happened. He may do so directly or by bringing it to the attention of the industrial engineer.

Quality control under an incentive system is very important, for the drive behind the operator is always production within time limits, with the possible result that quality specifications will be ignored. To overcome this, the accountant, with the industrial engineer, should determine the break-even point for sample testing by non-incentive employees, who have the authority to reject unsatisfactory work.

Under an incentive pay plan, it is usually recognized that the industrial engineer should not arbitrarily change the standards simply because the operators are attaining a high level of performance. However, there is a very legitimate reason for raising standards, i.e., when methods are changed. It is quite possible that the operators, themselves, will refine or change methods if they find that higher production results. This will be a gradual change and will come to the attention of the accountant in a sporadic fashion. The accountant who sees increasing amounts in the pay pretty much across the board on an operation can act as a check on the industrial engineer to determine the cause. Management can decide whether or not a suggestion award is in order to the operators who develop new methods, but the standards should not remain unchanged in these cases.

In short, the accountant's role in incentive payroll accounting can be very important to management. He should work closely with the industrial engineering, personnel, and production departments, so that all concerned will derive the most benefits from the incentive pay system.

HARRY E. BURTON

Notes on Current Reading

Books

Problems in Business Administration —Analysis by the Case Method

Thomas C. Raymond, McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y., 1955, 373 pp., $5.50.

There are some thirty cases which form the body of this book, each outlined in some detail, arranged in four principal groups, and left for solution by the student but not before seventy pages of preliminary material have oriented him in this task, with sample analyses and evaluation of these analyses. Among problems central to these cases are volume of a certain part to order, adoption of a new product to handle, purchase of an outside business by an established company, and erection of a new plant.

Montgomery's Federal Taxes

Edited by Philip Bardes, James J. Mahon, John McCullough, and Mark E. Richardson; The Ronald Press Company, 15 East 26th Street, New York 10, N. Y., 36th Edition, 1955, $15.00.

A work which reaches thirty six editions is at least notable if not standard. Certainly, this compact treatise on Federal taxation became, in the sense of reliability, authoritative in the life-time of the author and was kept up to date by revision. These are also expressed goals of the four partners of Lybrand, Ross Bros. & Montgomery who, as editors, have prepared the present edition.

Insurance Accounting — Fire and Casualty

Insurance Accounting and Statistical Association, The Spectator, Philadelphia, Pa., 1954, 351 pp., $12.50.

As indicated in its preface, this work on accounting in a specialized line is the result of the endeavors of many individuals in response to the need for it. The text is comprehensive, not omitting a description of "the evolution of insurance" and carrying on to treatment of its characteristic account and statement categories, their significance, and their handling.

Live Stock Accounting

J. Haisman, New Zealand Society of Accountants, 86 Lambton Quay, Wellington, N. Z., July 1955, paper bound,, 32 pp.

The subtitle of this work is "an inquiry into the problem of accounting for income from live stock farming in New Zealand." Written abroad in a land where the raising of sheep is a principal industry, the exposition is in part a discussion of the conditions underlying live stock accounting. Tax and legal questions are given considerable attention. Necessarily the account illustrations are in pounds, shillings and pence.

How to Increase Office Productivity

Earl P. Strong, Trico Service Co., 1337 S. Garner Street, State College, Pa., 1955, $2.75.

The six steps for increased productivity of office workers, dealt with in the principal chapters of this book, are job analyses, the setting of performance standards, improvement of methods, training office workers, setting up work incentives, and improving supervision "at all levels." Numerous illustrative forms and point listings appear in the course of these chapters and an appendix illustrates job analyses, "drills for skills" and rating charts.

Elementary Statistics—For Students of Social Science and Business

R. Clay Sprowls, McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y., 1955, 392 pp., $5.50.

The viewpoint of this book, which considers statistics as a means of making better decisions, will commend itself to accountants and businessmen. The work is a classroom textbook but its whole aim is broader and the text has been worded to accom-

SELECTED ARTICLES FROM ACCOUNTING PERIODICALS

THE CONTROLLER, *November* 1955 (2 Park Avenue, New York 16, N. Y., single copy $.50)

Financial Aspects of Automatic Computer Acquisition. Ned Chapin.

Operating Statements: Get Them While They're Hot. Munro Corbin.

*How the Controller Helps the Sales Manager. William H. Mordy.

Current Developments in Long-Term Export Financing. Ragnar W. Anderson.

COST AND MANAGEMENT, *October* 1955 (31 Walnut Street South, Hamilton, Ontario, Canada, single copy $.50)

The Accountant's Production: Reports. Marion H. Simpson.

A Unitized Cost, Billing, and Property Control System for Special Tooling. Robert W. Corson.

THE NEW YORK CERTIFIED PUBLIC ACCOUNTANT, *November* 1955 (677 Fifth Avenue, New York 22, N. Y., single copy $.50)

Accounting for a Motor Carrier's Accounts Receivable. Milton Rosenberg.

Current Trends in Accounting. Leo Rosenblum.

RETAIL CONTROL, *October* 1955 (100 West 31st Street, New York 1, N. Y., single copy $.75)

Accounts Receivable Procedures, Part II. Victor Begin.

*Further mentioned in accompanying notes on particular articles.

modate the reader as well as to reflect the subject. This must not be taken to mean that the text is not frequently broken by statistical and mathematical illustrations representing the tools which the statistical concepts make available.

Articles

Joint Cost Analysis as an Aid to Management

Arthur N. Lorig, The Accounting Review, October 1955.

Noting that joint cost determination has commonly been for the purpose of inventory valuation, the author comments that "there are conditions under which a joint cost calculation will reveal to management an indication as to whether or not a joint product should be processed beyond the split-off point." The paper (three pages) is devoted to an illustrative instance involving two products.

Electronic Data Processor—A Milestone in Machine Method

Harry D. Kerrigan, The Accounting Review, October 1955.

Embedded in this paper is a succinct description of a Remington Rand "Univac" pay check application, but, mainly, this article "places" advanced accounting equipment in the broad picture of mechanization, which not only has a future but has had a past. Of the future, the author says "the effects will be greater standardization, greater simplification, and greater merging of accounting procedures."

Three Guides to Profit Control

Raymond Villers, Dun's Review and Modern Industry, November 1955.

In this paper, addressed to the general executive, the construction and use of three charts are described for decision-making background and hypothesis formulation. The profit and loss chart is offered to reflect the cost-to-sales trend historically. The

SELECTED ARTICLES FROM BUSINESS PERIODICALS

ADVANCED MANAGEMENT, *November* 1955 (74 Fifth Avenue, New York 11, N. Y., single copy $.75 to members, $1.00 to nonmembers)

The Span of Control — Fact or Fable? Waino W. Suojanen.

Figures and the Manager. Othel D. Westfall.

DUN'S REVIEW AND MODERN INDUSTRY, *November* 1955 (99 Church Street, New York, N. Y., single copy $.75)

*Three Guides to Profit Control. Raymond Villers.

HARVARD BUSINESS REVIEW, *November-December* 1955 (Soldiers Field Station, Boston 63, Massachusetts, single copy $1.50)

Integration of People and Planning. Peter F. Drucker.

Are We Building Too Much Capacity? Robert P. Ulin.

Better Use of Executive Development Programs. Melvin Anshen.

Ten Problems That Worry Presidents. Lyle M. Spencer.

SYSTEMS AND PROCEDURES QUARTERLY, *November* 1955 (Box 281, Wall Street Station, New York, N. Y., single copy $1.00)

The Systems Department — Its Design and Construction. John M. Haslett.

Systems and Procedures — from the Ground Up. Vincent P. Connolly.

Why Procedure Manuals Differ. Robert C. Weisselberg and Harold M. Bailer.

Organization Planning — What It Will Do for You. R. C. Campbell.

Forms Control. John L. Primm.

*Further mentioned in accompanying notes on particular articles.

break-even chart is noted as requiring segregation of fixed expenses but permitting informative analysis of effects of alternative courses of action. The sales mixture chart is intended to provide a planning tool for a much ignored factor in operations.

How the Controller Helps the Sales Manager

William H. Mordy, The Controller, November 1955.

This is a paper in a somewhat neglected area of accounting services. Down-to-earth relationships are suggested, from the development by the controller of "efficient order-handling procedures" (among a group of aids classified as "humanics") to analysis of "the cost of selling of various size orders and customers by various channels of distribution" (among a group of aids classified as "mechanics"). The author, now in the sales field, has also held responsible accounting posts.

For Your Information

ABOUT THE REST OF THE CENTURY

Two STRIKINGLY different points of view appeared in the same batch of reading matter the other day and both bore a certain quality of conviction. One dealt with the American economy and the other with the Russian but they did not fail to make what might be called mutual reference. Attractively cover-illustrated with a graph depicting twentieth century America's economic progress and ups and downs to date, with two dotted lines suggesting alternative possibilities to the year 2000, a pamphlet appeared, entitled "Can We Depression-Proof Our Economy?" and issued as a Report of the Committee on Economic Policy of the United States, Chamber of Commerce. The pamphlet is obtainable at 50¢ a copy from the Chamber, Washington 6, D. C. (The committee is chairmanned by Harry A. Bullis, National President of N.A.C.A. 1932-33, who has been Chairman of the Board of Directors of General Mills, Inc., since 1948.) This pamphlet came to attention the same day that the New York Times reported excerpts of an address by Lazar M. Kaganovich, a First Deputy Premier of the Soviet Union, delivered at Moscow in the course of a celebration of the 38th Anniversary of the October Revolution. He asserted that, apparently apart from military action "the Twentieth Century is a century of the triumph of socialism and communism."

Both the American and Russian presentations showed awareness of the economy of the other country. This was less marked in the Chamber of Commerce committee report which, however, commented, "For international reasons as well (as domestic) the attainment of this goal (sustained prosperity) is important. It will refute the Marxists' criticisms of private capitalism both here and abroad." The address of the Russian official took the trouble to impute instability to our economy, "a capitalist economy develops according to its own laws, through crises, over intervals" and to cite figures allegedly accurate as to unemployment and time lost through strikes.

It is not necessary to give any degree of credence to the implications of the Russian viewpoint (nor to probe into the essential instability of a managed economy conducted by a police state) to recognize a suggestion in these items of reading material, taken together, that nothing—certainly not war—is likely to be more damaging to the future of communism in the world than a demonstration of economic invulnerability by the country which most competely combines political democracy and economic capitalism. The report of the Committee on Economic Policy is replete with thoughts adding up to the opinion that freedom from disastrous cyclical disturbances — depressions — can be had, not for the asking but for the exercise of wisdom, with the vigilance long conceded in popular thought to be "the price of liberty."

The appropriateness of summarization here of the elements in this wisdom might be doubtful if a number of these elements did not cluster about the stability of individual businesses. Contributions to such stability, today and for the future, underlie almost every endeavor of the industrial accountant. If helping to keep his company operating in the light of facts will help him keep his countrymen from feeling the impact of economic activity changes, (and bewilder those who oppose democracy and capitalism) his interests in the techniques employed, will surely become even deeper than it is.

Actions Beyond the Reach of the Individual Business

This is not to say that public policy is by-passed in the committee report. To the contrary, the report makes much of the Employment Act of 1946 and its administration and identifies sources of economic stability external to companies. Indeed the brief review of some aspects of recent economic history, which the committee report contains, attributes a function to the government and its agencies of acting to control economic factors in such timely fashion that moderate action "does the trick". The whole matter of money supply is placed largely in this area. Here fall also such influences as government expenditures, taxation, price supports if needed, and contracyclical laws like unemployment compensation and old age pensions, although the last named is by no means all within the governmental province but now commonly engages company policy and its implementation, much of which is in the area of accounting. Many of these broad-scale aids to economic stability are designated as "built-in" or "automatic" stabilizers, "cyclical snubbers," or "recession antibodies". They are not regarded as sure-fire devices but rather, quite cautiously, as influences which may have been operative in restricting sharpness of changes since World War II.

Business Action Involving the Future

The industrial accountant will feel more at home with certain other stability factors to which the report of the Committee on Economic Policy also gives space and emphasis, and relates to developments in the character of American business over the period since 1946. It is not inquired just why business executives—and there is no indication that reference is made solely to company presidents or is limited to line executives—have been inclined to study more aspects of their companies' situations and to derive these more soundly and apply them at greater range than in earlier periods of American life. It is, however, regarded as a stabilizing fact that this is so and a tribute to a more inclusive type of management.

In short, it is pointed out that the sole objective of maximum profits in the short range, whatever the company's fate in the long-range, has given way to a type of management which, it turns out, serves the company and the economy best in both the short and the long-term. It is a type of management in which the industrial accountant shares. It is based on the following emphasis, to use the words of the report in commenting on a study there cited:

"The emphasis is on smart price policy adapted to changing phases of the business cycle: product-mix changes, the timing and acceleration of technological and market research and innovation in product development and promotion, the development of supplementary lines and diversification so as to mitigate the cycle, etc. It is possible that the business executive can do more to help stabilize investment and the entire economy if he concentrates on such matters as appropriate price policy, inventory policy, diversification, product-mix, etc., rather than strikes out directly to stabilize his own rate of real capital formation. No individual business, unless very large and growing steadily, can be expected to make the same new investment year after after at a steady rate. Accumulating inventory in excessive volume has been a substantial source of instability. In emphasizing the indirect approach to investment stabilization, we are not under emphasizing the importance of sustained investment for the ecenomy as a whole, or of steady growth. The increasing concern with business forecasting and the multitude of speeches at business meetings on the business and eco-

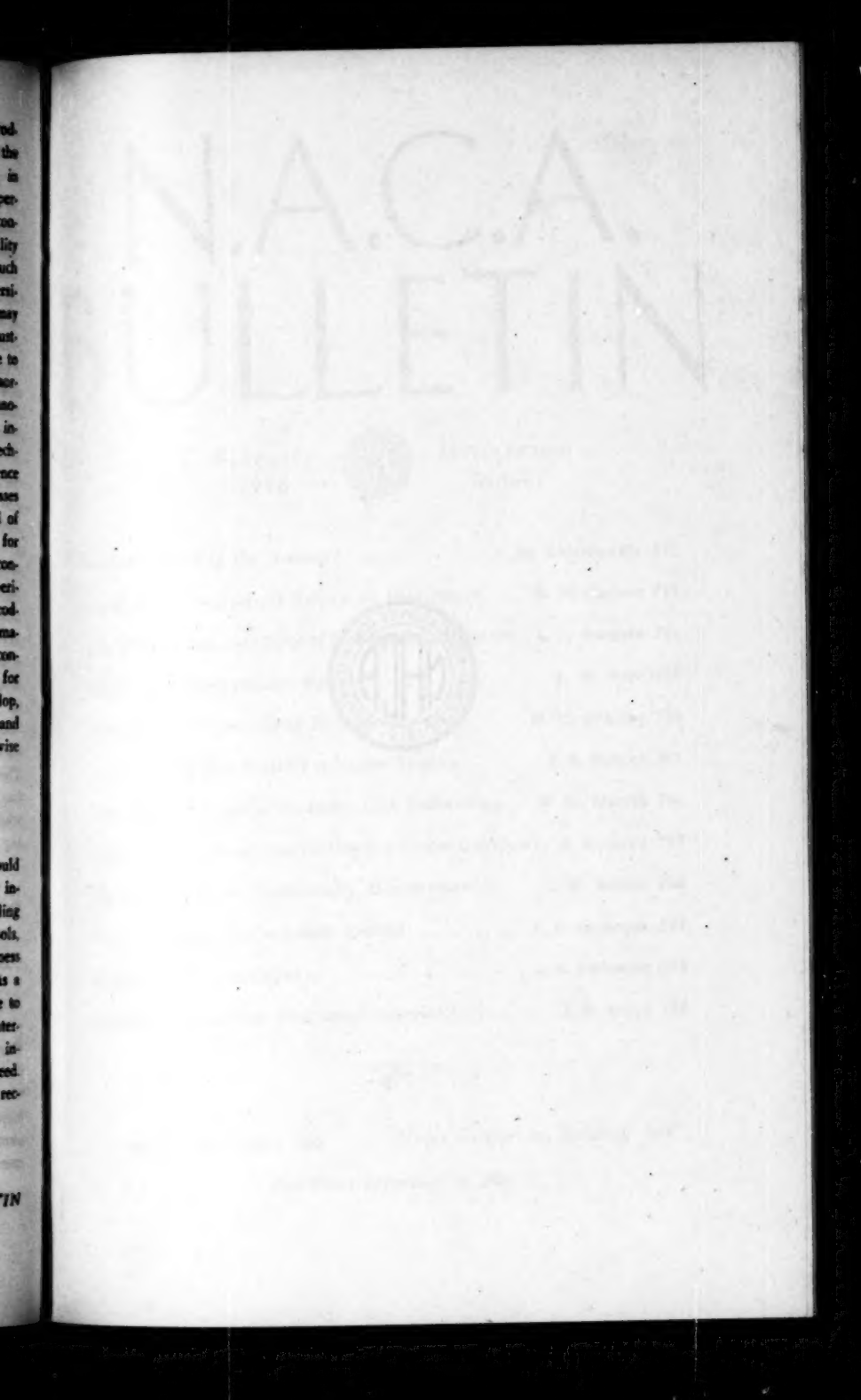
nomic outlook suggest an abiding conviction among business executives that by better appraisals preventive steps can be taken. Better market analysis and short-range forecasting particularly will make an effective contribution toward the reduction of the inventory cycle."

Very few, if any, of the policies matters mentioned above do not depend for implementation on the skilled preparation and equally skilled application of cost and financial statements drawn from prior experience and, even more, of projections based on an amalgam of such experience with operating conditions, present and future. It is accepted today that the task of making such statements objective, useful and used is largely a responsibility of accountants in management, their unrestricted share of the expanded process of management and their vantage point at the council table.

"Structural Changes" in the Economy

The report of the Chamber Committee on Economic Policy also calls attention to another matter in which accounting is intimately interested. In the following words, it suggests that a further element of post-war stability in American business has been structural change occasioned by the rise of new industries, diversification of old ones, and a technological picture of product development which renders "standing pat" the death-knell of enterprises:

"A number of economists believe that some structural features of our economy have changed in such a direction that we are less vulnerable to depressionary forces. Our 'industries' are much less homogeneous and far more numerous today than formerly. The chemical 'industry' is so broad that from the standpoint of cyclical analysis it can scarcely be labelled 'an industry.' It covers so many varieties of raw materials, intermediate and end products that most other industries in the country are to some extent 'chemical' in nature. This type of structural change pervades our economy and is likely to continue. For this reason, there is a possibility that the economy, having become much more complicated and much more diversified so that no one phase dominates, may be less vulnerable as a whole to maladjustments that inevitably develop from time to time. Allied with the foregoing is the enormous and growing emphasis on technological change. Research, discovery and innovation are the foundations of this technological change. The rate of obsolescence of raw materials, of production processes and intermediate and end products, and of methods of distribution and even media for advertising, may similarly make our economy less vulnerable to depression and periodic stagnation. In other words, no product, no method, no procedure, no raw material is viewed as final today. There is constant opportunity for innovation and for improvement. As vulnerable spots develop, or markets begin to soften, innovations and research will help fill up what otherwise might become a vacuum."

Individual Businesses and Lines May Face Individual Troubles

Comment on the committee's report should not fail to include mention of repeated indication that, not only are we still feeling our way in the use of contra-cyclical tools, but also that individual lines of business will suffer blows which the economy as a whole may not feel (and must prepare to weather them) and that individual enterprises are in a similar situation—their individualism must often be "rugged" indeed. Here, too, a challenge to accountants is recognizable.